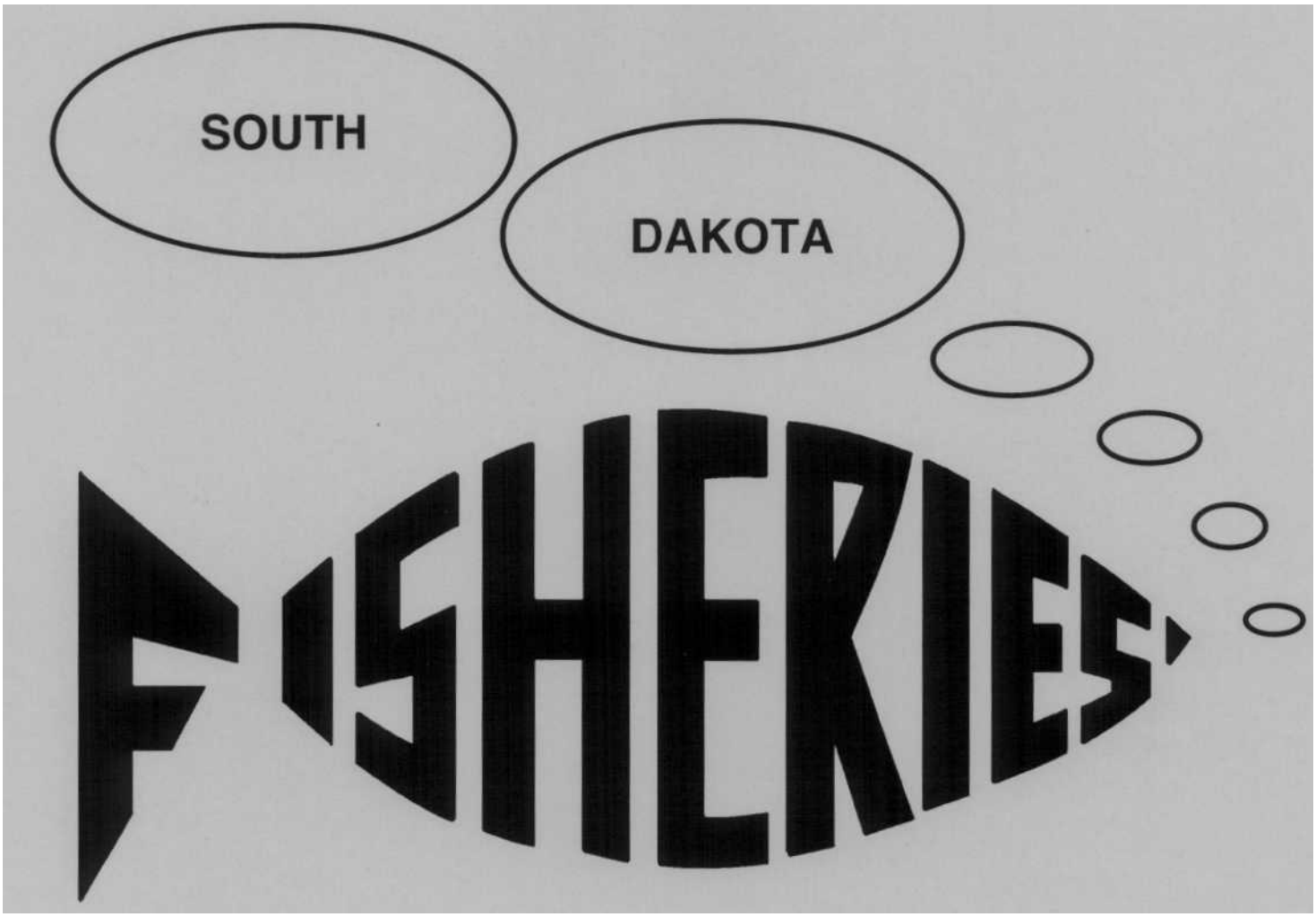


# ANNUAL FISH POPULATION SURVEYS OF LEWIS AND CLARK LAKE, 2003

**South Dakota Department of Game, Fish and Parks**
**Wildlife Division**
**Joe Foss Building**
**Pierre, South Dakota 57501-3182**

**Annual Report No. 04-09**

# ANNUAL FISH POPULATION SURVEYS OF LEWIS AND CLARK LAKE, 2003

by
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## Preface

Information collected from Lewis and Clark Lake during 1999-2003 is summarized in this report. Copies of this report and references to the data can be made with permission from the author or the Director of the Division of Wildlife, South Dakota Department of Game, Fish and Parks, 523 E. Capitol, Pierre, South Dakota 57501-3182.

The author would like to acknowledge the following individuals from South Dakota Game, Fish and Parks who helped with data collection, analysis, editing, and manuscript preparation: Jim Riis, John Lott, Robert Hanten, Jason Sorensen, Kyle Potter, Brian Beel, John Wayne Kalda, Michael Bertrand, Jared Caba, Casey Griffith, and Robert Schunout. The collection of data for these surveys was funded, in part, by Federal Aid in Sport Fish Restoration, (D-J) project F-21-R, "Statewide Fish Management Surveys". Some of these data have been previously presented in segments F-32, 33, 34, and 35.

## Executive Summary

This report includes data from annual fish population surveys conducted during 1999-2003 for Lewis and Clark Lake and the Missouri River upstream and downstream of the reservoir. These surveys provide a means of evaluating management strategies contained in the Missouri River Fisheries Program strategic plan. Results and discussion in this report relate to changes in the fish community, population structure of sport fishes, angler use of the resource, and evaluation of management activities.

Seventeen species of age-0 fishes or small littoral fishes were sampled with seines in Lewis and Clark Lake in 2003. Emerald shiner catch per unit effort (CPUE) was the highest of all species, and more than doubled from 2002. Age-0 gizzard shad and white bass, spottail shiner, and spotfin shiner were common in the catch. Both age-0 walleye and sauger were present in seine samples, but decreased in abundance from 2002.

Fifteen fish species were sampled with gill nets in Lewis and Clark Lake during 2003. Walleye and sauger dominated the catch, but walleye CPUE increased while sauger CPUE decreased from 2002. Channel catfish CPUE continued to decline from a peak in 2001. One pallid sturgeon, 753 mm fork length, was sampled and released in Lewis and Clark Lake in 2003.

The 2003 walleye catch in the standard Lewis and Clark Lake gill net catch was dominated by the 2001 year-class. Walleye proportional stock density (PSD) increased to 61, relative weights (Wr) ranged from 80 to 87 for the various relative stock density (RSD) length categories, and annual survival was estimated at 66%. The 2001 year-class was also most abundant in the sauger population. Sauger PSD decreased to 93, Wr ranged from 79 to 80 for the various RSD length categories, and annual survival was estimated at 65%. Channel catfish CPUE continued to decline from a peak in 2001, PSD decreased to 64, and Wr's increased from the mid 80's to upper 80's for the RSD length categories.

Lewis and Clark Lake flathead catfish daytime electrofishing CPUE declined to 21.6 fish/h during 2003. Mean Wr's were 85 and 91 for stock-quality and quality-preferred length categories respectively, PSD was 57, and estimated annual survival increased to 64%.

Smallmouth bass nighttime electrofishing CPUE in Lewis and Clark Lake, near Gavins Point Dam, increased to 25.0 fish/h in 2003. Mean Wr's ranged from 90 to 100 for the various RSD length categories, PSD was 48, and estimated annual survival was 48%. Daytime electrofishing catch of smallmouth bass in Gavins Point Dam tailwater decreased to 34.0 fish/h. Mean Wr's for the various RSD length categories ranged from 88 to 90, PSD was 4, and estimated annual survival was 29%. Nighttime electrofishing catch per unit effort of smallmouth bass in Ft. Randall Dam tailwater decreased to 51.0 fish/h, while PSD decreased to 22. Mean Wr's ranged from 93 to 104 for the various RSD length categories and annual survival was estimated at 58%. Smallmouth bass daytime electrofishing CPUE for the

Missouri River near Springfield was 15.0 fish/h. The PSD was 87, mean Wr's ranged from 90 to 101 for the various RSD length categories, and survival was estimated at 82%.

Daytime electrofishing CPUE for largemouth bass in the Missouri River near Springfield, SD was 32.5 fish/h in 2003. The PSD was 57, mean Wr's ranged from 102 to I 1 l for the various RSD length categories, and survival was estimated at *70%*.

Channel catfish CPUE, for baited hoop nets in the Missouri River near Springfield, SD during 2003, was 2.5 fish/net-night, the highest documented. Weighted mean length was 296 mm, mean Wr's ranged from 74 to 84 for the various RSD length categories, and PSD declined to 21.

Eight species of age-0 fishes or small prey fishes were collected with seines in the Missouri River near Springfield, SD in 2003. Emerald shiner was most abundant in the catch. Age-0 largemouth bass and smallmouth bass and spotfin shiner were also common. Five species had lower CPUE's in 2003 than 2002, while 3 species had higher CPUE's. Six species that were sampled in 2002 were not sampled in 2003.

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# ANNUAL FISH POPULATION SURVEYS OF LEWIS AND CLARK LAKE, 2003

## INTRODUCTION

Lewis and Clark Lake provides a valuable fisheries resource for the state of South Dakota. This mainstem Missouri River reservoir spans over 10,000 hectares and annually supports over 100, 000 hours of fishing activity (Stone 1985; Wickstrom 1995; Wickstrom 1996; Mestl et al. 2001; Wickstrom et al. 2002). The Lewis and Clark Lake fishery had an estimated worth of over $3. 3 million in 2001 (Wickstrom et al. 2002). Lewis and Clark Lake is also important because the fishery is in an area with a relatively low density of quality fishing waters and is close to major population centers.

Because of the importance of this fishery, the fish community must be effectively managed to provide optimal recreational benefits while maintaining species diversity and protecting the native fish community. A prerequisite to development of effective management strategies is acquisition and analysis of data describing the fish community. This report contains data collected from Lewis and Clark Lake fish populations during 2003 and fish population surveys in the Missouri River upstream and downstream of Lewis and Clark Lake during 2003. These studies of the Missouri River and Lewis and Clark Lake fisheries are designed to fulfill strategies and evaluate objectives of the Missouri River Fisheries Program strategic plan (South Dakota Department of Game, Fish and Parks 1994) and Lewis and Clark Lake Strategic Plan (unpublished 1998).

A major change in harvest regulations went into effect in 2000. A year-round, 381 mm, minimum length limit was placed on walleye, sauger, and their hybrids in the Missouri River from Gavins Point Dam upstream to the South Dakota-Nebraska border below Ft. Randall Darn. The desired effect of the length limit was to extend the length of time that periodic, large year-classes of walleye and sauger would be available to anglers by restricting the harvest of small fish and preventing their early removal from the population. Factors that indicated a size limit would be effective were low density of walleye and sauger, good growth rates, and excessive harvest of walleye and sauger at small sizes (Wickstrom 1995; Wickstrom 1996; Wickstrom 2000). This report continues to evaluate the effectiveness of the regulation change.

## OBJECTIVES

Objectives of annual fish population surveys are to provide information on:

1) species composition
2) relative abundance
3) age, growth, and condition
4) reproduction and recruitment
5) survival and mortality rates

6) population size structure
7) effects of regulations
8) effects of sportfish harvest.

Emphasis is given to important sport or prey species, as well as species that are threatened or endangered. Common and scientific names of fishes contained in this report are provided in Appendix 1.

## STUDY AREA

The study area is comprised of Lewis and Clark Lake, a reach of unchannelized Missouri River upstream of the reservoir, and Gavins Point Dam tailwater (Figure 1). Lewis and Clark Lake, formed by Gavins Point Dam, covers approximately 10,500 hectares and extends from near Yankton to Springfield, SD. The upstream river reach is approximately 60 km long and extends from Springfield to Ft. Randall Dam.

Lewis and Clark Lake has a maximum depth of 16.7 m and a mean depth of 5.0 m. The bottom is comprised of mud, silt, sand, and gravel. Water sources for the lake are the Missouri River and local tributaries entering the lake. The Niobrara River, which flows from the southwest, enters upstream of Lewis and Clark Lake near river mile (RM) 844 and is the major tributary between Ft. Randall and Gavins Point Dams. Management classification of Lewis and Clark Lake is cool and warm water permanent.

## METHODS

### LEWIS AND CLARK LAKE FISH COLLECTION

Variable-mesh gill nets and seines were used to sample fish populations in Lewis and Clark Lake during 2003. A variable-mesh gill net of multifilament nylon measured 91.4 m long by 1.8 m deep and contained 15.2 m panels of each of the following bar mesh sizes: 12.7 mm, 19.1 mm, 25.4 mm, 31.8 mm, 38.1 mm, and 50.8 mm. A total of twelve gill nets were fished overnight, approximately 20 hours, on the bottom in Lewis and Clark Lake during September 15-18, 2003. Three gill nets were fished in each 0-12 m stratum near the Bon Homme Colony (RM 824) and Tabor Access Area (RM 820) (Figure 1). Three gill nets were fished near Gavins Point (RM 814) in each 0-12 m and 12-24 m strata (Figure 1). All fish collected with gill nets during 2003 were identified, counted, measured for total length, and weighed. Scales were collected from walleye and sauger below the lateral line near the distal end of the pectoral fin (Al-Absy and Carlander 1988).

A nylon 6.4 mm mesh bag seine, measuring 30.5 m long by 2.4 m deep with a 1.8 m by 1.8 m bag, was used to collect age-0 fishes and small littoral species. A quarter-arc seine haul was

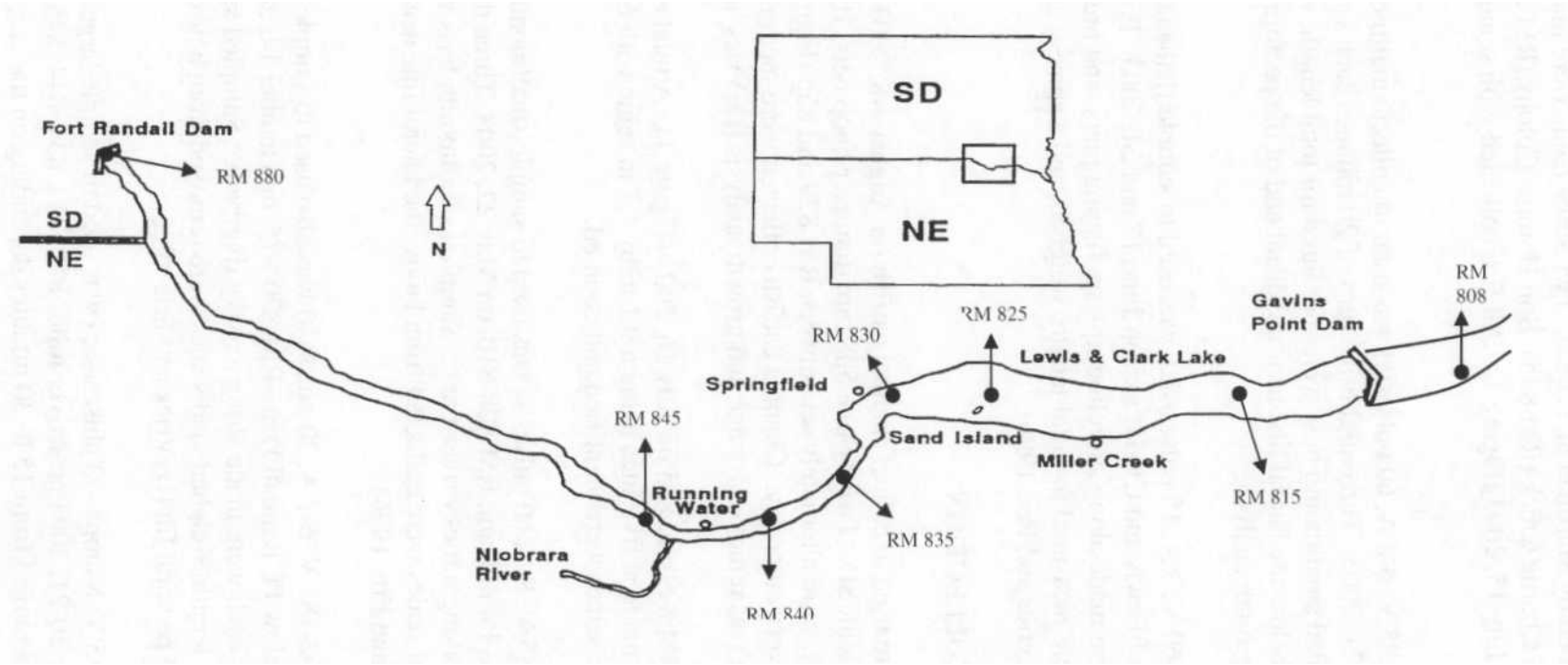


Figure 1. Lewis and Clark Lake and Missouri River study area from river mile (RM) 808 to 880.

made using methods described by Martin et al. (1981). Two seine hauls were made at each site near Sand Creek (RM 828), Charlie Creek (RM 825), Bon Homme Colony (RM 822), and Gavins Point (RM 815) on July 15, 2003 (Figure 1). All fish collected with seines were identified and counted.

Pulsed DC electrofishing (185 V, 6-8 A, 60 pulses/s) was used to collect smallmouth bass along Gavins Point Dam on May 21, 2003. Three nighttime runs of 20 minutes each were made along rip-rapped shoreline. Sampled smallmouth bass were measured for total length, weighed, and scales were collected from below the lateral line near the distal end of the pectoral fin (Devries and Frie 1996) for age and growth analysis.

Pulsed DC electrofishing (460 V, 3 A, 15 pulses/sec) was used to sample flathead catfish along the south shore (Nebraska) of Lewis and Clark Lake on June 17 and 24, 2003. Four daytime runs of 15 to 20 minutes each were made along shoreline rip-rap, fishing piers, and breakwaters. Sampled flathead catfish were measured for total length, weighed, and a spine was removed for age and growth analysis (Devries and Frie 1996).

MISSOURI RIVER FISH COLLECTION

Cheese-baited hoop nets were used to collect channel catfish on August 4-8, 2003 from the Missouri River near Springfield, SD. Twenty-one 508 mm diameter hoop nets, 10 of 25 mm mesh and 11 of 38 mm mesh, were alternately set between RM 829 and 835 ( Figure 1). Hoop nets were checked for fish every other day. Channel catfish collected were measured for total length, weighed, and a spine was removed for age and growth analysis ( DeVries and Frie 1996).

Seining was done between RM 829 and 835 on July 16, 2003 (Figure 1). A total of 22 quarter-arc seine hauls were made at five sites using a 9.1 m by 1.2 m seine with 6 mm nylon mesh. All fish sampled with seines were identified and counted.

Pulsed DC electrofishing (185 V, 8 A, 60 pulses/s) was used to sample smallmouth bass in the Missouri River below Gavins Point Dam, RM 808-8 10, on May 22, 2003. Three daytime runs of 20 minutes each were made along a rocky river-bank. Sampled smallmouth bass were measured for total length, weighed, and scales were collected from below the lateral line near the distal end of the pectoral fin (DeVries and Frie 1996).

Pulsed DC electrofishing (162-185 V, 6-7 A, 30 pulses/s) was also used to sample smallmouth bass in the Missouri River below Ft. Randall Dam, RM 870-875, on October 14, 2003. Three nighttime runs of 20 minutes each were made along a rocky riverbank. Sampled smallmouth bass were measured for total length, weighed, and scales were removed from below the lateral line near the distal end of the pectoral fin (DeVries and Frie 1996).

Pulsed DC electrofishing (185 V, 8 amps, 60 pulses/sec) was used to sample largemouth bass and smallmouth bass on May 20-21, 2003 near river miles 829, 833, 834, 844, 845, 846, 848, and 852 ( Figure 1). Daytime runs ranged from 15 to 30 minutes depending on the amount of suitable

habitat at a given location and number of fish sampled. Locations sampled typically yielded either or both species during previous years. Total lengths and weights were recorded for both species. Scales were collected from smallmouth bass and largemouth bass below the lateral line near the distal end of the pectoral fin (DeVries and Frie 1996) .

DATA ANALYSIS

Relative abundance of fish species was expressed as mean catch per unit effort (CPUE) for variable-mesh gill nets (number/net-night), seines (number/haul), hoop nets (number/net-night), and electrofishing (number/h). Age and growth analyses were conducted for walleye, sauger, largemouth bass, smallmouth bass, and flathead catfish. Only channel catfish sampled in gill nets were analyzed for age and growth in 2003.

All suitable scale samples were aged and annuli measured with the aid of a microfiche reader (Jearld 1983). All catfish spines collected were aged. Spines were sectioned to 0.6 mm thickness with an Isomet saw set on 6.5 speed using 75 g pressure. Sections were read with a binocular scope at 10 power. Back-calculations from scale and spine measurements were made using WinFin 2.95 (Francis 2000a) and WinFin Analysis (Francis 2000b) computer programs. Standard Y-intercept values suggested by Carlander (1982) were used for walleye (55 mm), sauger (55 mm), smallmouth bass (35 mm), channel catfish (30 mm), and flathead catfish (30 mm). Age distributions were developed by assigning ages to all fish sampled with gill nets, hoop nets, trap nets, or electrofishing.

Proportional stock density (PSD; Anderson and Weithman 1978) and relative stock density (RSD) values were calculated for walleye, sauger, channel catfish, largemouth bass, smallmouth bass, flathead catfish, freshwater drum, gizzard shad, and river carpsucker. Length categories used to calculate PSD and RSD are provided in Table I (Anderson and Neumann 1996; Bister et al. 1999).

Table I. Mininuun total lengths (mm) for Iength class designations.

| Species | Stock | Quality | Preferred | Memorable |
|---|---|---|---|---|
| Walleye | 250 | 380 | 510 | 630 |
| Sauger | 200 | 300 | 380 | 510 |
| Largemouth bass | 200 | 300 | 380 | 510 |
| Smallmouth bass | 180 | 280 | 350 | 430 |
| Channel catfish | 280 | 410 | 610 | 710 |
| Flathead catfish | 280 | 410 | 610 | 710 |
| Freshwater drum | 200 | 300 | 380 | 510 |
| River carpsucker | 180 | 280 | 360 | 460 |
| Gizzard shad | 180 | 280 | | |

* not established

Relative weights *(Wr;* Anderson 1980) were calculated for length categories using standard weight equations for walleye, sauger, channel catfish, largemouth bass, and smallmouth bass provided by Anderson and Neumann (1996). The flathead catfish standard weight equation was provided by Murphy et al. (1991). Standard weight equations for freshwater drum, gizzard shad, and river carpsucker were provided by Bister et al. (1999). Standard weight equations used in this report are provided in Appendix 2.

Length-weight regression equations were developed for walleye, sauger, channel catfish, flathead catfish, largemouth bass, and smallmouth bass using Systat 8.0 (SPSS 1998). The equations are presented in Appendix 3.

Survival and mortality estimates were calculated using catch curves (Ricker 1975). The age that fish were first fully susceptible to the sampling gear was coded as "1", the second as "2", and so forth. Two or more consecutive years of age distribution data were combined for analysis, when available, to reduce the effects of variable recruitment.

## RESULTS AND DISCUSSION

### LEWIS AND CLARK LAKE-SEINES

Seventeen species of age-0 fishes or small littoral species were sampled with seines during 2003 (Table 2). All species have been previously sampled from Lewis and Clark Lake (Wickstrom 2002). Catch-per-unit-effort for most species was higher in 2003 than 2002, but was lower than 2001. Emerald shiner, gizzard shad, common shiner, spotfin shiner, and spottail shiner CPUE more than doubled from 2002 to 2003. Catch of spotfin shiner was the highest of the five-year period. Catches of age-0 walleye and sauger were at, or near, the lowest of the five-year period.

### LEWIS AND CLARK LAKE-GILL NETS

#### Species Composition and Relative Abundance

Gill nets sampled 15 species of fish in Lewis and Clark Lake during 2003 (Table 3). All species have been previously reported (Wickstrom 2(x)1). Gizzard shad, freshwater drum, channel catfish, sauger, and walleye were common in the catch (Figure 2). Channel catfish and river carpsucker CPUE continued to decline from 2001 and were the lowest of the five-year period. Walleye CPUE increased from 2002 to 2003. Sauger and freshwater drum CPUE in 2003 were similar to 2002, but CPUE both species in 2002 and 2003 declined from a peak in 2001. Population indices for freshwater drum, gizzard shad, and river carpsucker are provided in Appendix 4.

Gill net catches of sauger 380 mm (15 inches) and longer averaged 4.25 fish/net-night, compared to 4.5 fish/net-night in 2002, 4.8 fish/net-night in 2001, and 2.0 fish/net-night in 2000. Mean CPUE of walleye 380 mm and longer was 5.5 fish/net-night, compared to 2.7 fish/net-night in

2002, 3.5 fish/net-night in 2001 and 1.5 fish/net-night in 2000. Catches of sauger longer than 380 mm have been fairly stable since an increase in 2001. Catches of walleye longer than 380 mm have increased since 2000.

One pallid sturgeon, approximately 752 mm fork length, was captured in the lower portion of Lewis and Clark Lake near Gavins Point (RM 8 14) at a depth of approximately 12 m. The fish appeared to be in excellent condition and was immediately returned to the water. This fish is suspected to have originated from a pallid sturgeon stocking that occurred in 1997 in the Missouri River upstream of Lewis and Clark Lake (Personal communication, Wayne Stancill, United States Fish and Wildlife Service). Pallid sturgeon have previously been captured in Lewis and Clark Lake (Walburg 1964; Wickstrom 2003) and in the Missouri River near Running Water, SD (Stastny 1994).

Table 2. Mean catch per seine haul, sampling stations combined, of age-0 and small littoral fishes from Lewis and Clark Lake, 1999-2003 (standard error).

| Species | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Bigmouth buffalo | 0.0 | 0.0 | 0.0 | 0.1(0.1) | 0.0 |
| Black crappie | 1.9(1.5) | 0.0 | 0.0 | 0.5(0.3) | 0.0 |
| Bluegill | 0.0 | 0.0 | 0.3(0.2) | 0.1(0.1) | 0.0 |
| Bluntnose minnow | 0.0 | 0.0 | 0.1(0.1) | 0.0 | 0.0 |
| Brassy minnow* | 0.0 | 0.0 | 0.0 | 0.0 | 0.6(0.2) |
| Common carp | 0.0 | 0.0 | 0.6(0.4) | 0.0 | 0.1(0.1) |
| Common shiner | 0.0 | 0.0 | 0.3(0.2) | 0.0 | 5.8(4.5) |
| Creek Chub | 0.0 | 0.0 | 0.8(0.5) | 0.0 | 0.0 |
| Emerald shiner* | 348.8(181.3) | 214.4(85.1) | 1399.8(1807.9) | 189.9(72.2) | 412.0(221.7) |
| Fathead minnow* | 0.0 | 0.1(0.1) | 0.0 | 0.0 | 0.0 |
| Freshwater drum | 0.0 | 6.5(3.1) | 3.8(1.7) | 2.1(1.5) | 0.0 |
| Gizzard shad | 58.3(33.3) | 125.9(82.7) | 5.5(3.7) | 16.6(14.6) | 76.5(53.2) |
| Golden shiner | 0.0 | 0.0 | 0.1(0.1) | 0.0 | 0.0 |
| Johnny darter* | 5.1(2.1) | 6.1(3.7) | 0.5(0.3) | 0.5(0.2) | 1.0(0.7) |
| Largemouth bass | 2.1(0.7) | 0.4(0.2) | 1.3(0.5) | 0.5(0.5) | 0.4(0.4) |
| Rainbow smelt | 0.0 | 0.0 | 0.1(0.1) | 0.0 | 0.0 |
| Red shiner* | 0.1(0.1) | 0.3(0.2) | 0.4(0.4) | 0.0 | 0.0 |
| River carpsucker | 0.0 | 0.3(0.2) | 0.3(0.2) | 0.4(0.2) | 0.3(0.2) |
| Sauger | 0.8(0.5) | 0.0 | 0.4(0.2) | 0.4(0.2) | 0.1(0.1) |
| Shorthead redhorse | 0.1(0.1) | 0.0 | 0.1(0.1) | 0.0 | 0.0 |
| Shortnose gar | 0.1(0.1) | 0.0 | 0.0 | 0.0 | 0.1(0.1) |
| Silver chub* | 0.0 | 0.1(0.1) | 0.1(0.1) | 0.0 | 0.0 |
| Smallmouth bass | 2.0(0.7) | 2.4(0.6) | 0.6(0.3) | 1.1(0.6) | 1.5(0.7) |
| Smallmouth buffalo | 0.0 | 0.0 | 0.4(0.2) | 0.0 | 0.0 |
| Spotfin shiner* | 1.5(1.0) | 2.0(1.6) | 8.9(2.9) | 0.1(0.1) | 11.9(8.5) |
| Spottail shiner* | 4.1(3.9) | 3.6(2.1) | 30.5(24.4) | 2.5(1.8) | 12.4(11.4) |
| Walleye | 3.6(1.6) | 2.1(1.2) | 1.5(1.1) | 3.0(1.2) | 1.4(0.6) |
| White bass | 250.6(133.7) | 64.3(32.4) | 90.5(46.8) | 14.5(9.8) | 19.6(16.2) |
| White crappie | 6.3(3.0) | 0.5(0.4) | 0.0 | 1.0(1.0) | 0.1(0.1) |
| Yellow perch | 1.4(1.2) | 3.8(1.8) | 22.1(16.3) | 1.0(0.7) | 0.6(0.6) |
| Cyprinidae larvae | 0.0 | 0.4(0.4) | 0.0 | 0.0 | 0.0 |

* includes both young-of-year and adults

Table 3. Mean gill net catch per lift, sampling stations combined, for Lewis and Clark Lake, 1999-2003 (standard error).

| Species | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Bigmouth buffalo | 0.2(0.2) | 0.0 | 0.0 | 0.0 | 0.0 |
| Channel catfish | 3.8(1.3) | 3.9(0.5) | 4.7(1.3) | 3.3(0.8) | 2.4(0.5) |
| Common carp | 0.3(0.1) | 0.1(0.1) | 0.3(0.1) | 0.5(0.2) | 0.1(0.1) |
| Emerald shiner | 0.1(0.1) | 0.0 | 0.0 | 0.0 | 0.0 |
| Freshwater drum | 3.3(1.1) | 8.2(1.4) | 24.6(8.6) | 5.0(1.4) | 6.0(1.2) |
| Gizzard shad | 1.1(0.4) | 17.1(4.1) | 13.6(4.8) | 5.5(2.0) | 2.7(0.8) |
| Paddlefish | 0.0 | 0.0 | 0.0 | 0.1(0.1) | 0.0 |
| Pallid sturgeon | 0.0 | 0.0 | 0.0 | 0.1(0.1) | 0.1(0.1) |
| River carpsucker | 3.0(0.9) | 1.7(0.7) | 7.3(2.0) | 1.6(0.8) | 0.4(0.2) |
| Sauger | 6.0(0.9) | 6.0(1.5) | 13.5(1.4) | 8.9(1.1) | 8.1(1.7) |
| Shorthead redhorse | 0.1(0.1) | 0.3(0.2) | 0.2(0.1) | 0.3(0.2) | 0.6(0.4) |
| Shortnose gar | 0.3(0.2) | 0.6(0.2) | 0.9(0.5) | 0.0 | 0.4(0.3) |
| Smallmouth buffalo | 0.4(0.3) | 0.1(0.1) | 0.3 (0.2) | 0.0 | 0.1(0.1) |
| Spottail shiner | 0.1(0.1) | 0.0 | 0.1(0.1) | 0.0 | 0.1(0.1) |
| Walleye | 3.8(1.0) | 5.2(1.3) | 11.9(2.5) | 8.3(1.3) | 10.7(1.0) |
| White bass | 0.0 | 0.1(0.1) | 0.4(0.3) | 0.2(0.2) | 0.2(0.1) |
| White crappie | 0.8(0.4) | 0.6(0.3) | 2.9(1.5) | 1.8(1.2) | 0.9(0.6) |
| Yellow perch | 0.1(0.1) | 0.0 | 0.1(0.1) | 0.0 | 0.1(0.1) |

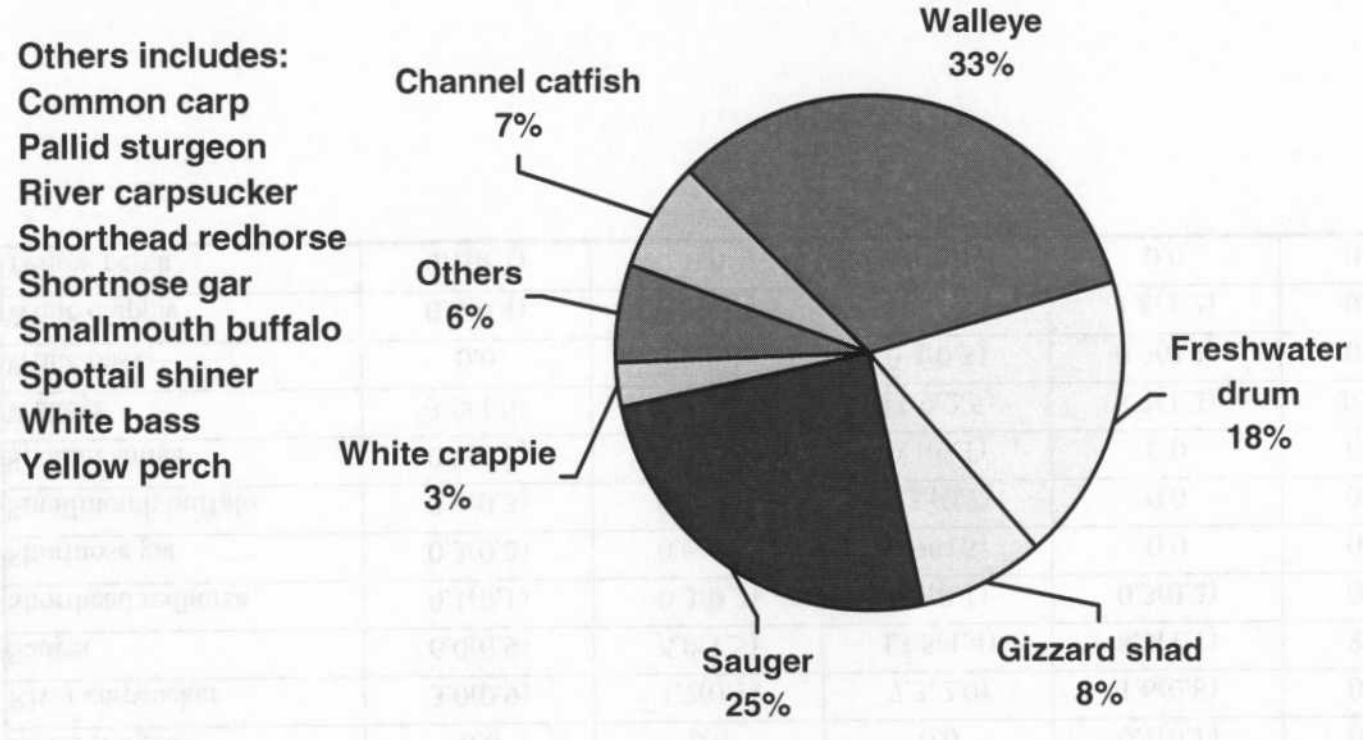


Figure 2. Fish species composition, by percent of total, from Lewis and Clark Lake gill net catches during September 2003.

Walleye Population Parameters

Eleven age-groups of walleye were represented in the 2003 gill net sample and ranged in total length from 130 mm to 570 mm (Figure 3). Walleye growth increments during 2002 in Lewis and Clark Lake were mostly in the range of previous years (Table 4). Table 5 provides the mean total length at a given age, as determined by back-calculation, for all year-classes of walleye sampled in 2003.

Mean age of walleye increased to 2.8 years during 2003 (Table 6). Age and growth analysis revealed that a large walleye year-class was produced in 2001 and remains well represented in the population at age-2. Walleye PSD increased to 61 during 2003 (Table 7), the result of a strong 2001 year-class growing past quality length. Mean relative weight for 2003 was the highest of the five-year period for stock-quality length fish, in the range of previous years for quality-preferred length fish, and among the lowest for preferred-length fish (Table 8). Total length-weight regression equations for walleye are supplied in Appendix 3.

Annual survival for 2002-2003 pooled walleye data, as estimated from catch curve analysis ( Ricker 1975) and excluding age-0 fish, was 66% (r'=0.75, Table 9). Estimated survival for the 2002-2003 pooled sample was the highest since the 1998-1999 pooled sample. A declining trend of survival had been observed for previous years.

Sauger Population Parameters

Sauger growth increments during 2002 were less than previous years for all growth periods except 0-1 (Table 10). Mean total lengths at a given age, as determined by back-calculation, for all sauger year-classes are presented in Table 11. Saugers were shorter in total length than walleyes during 2002 at ages 2, 3, 4, 5, and 6.

Mean age of sauger sampled from Lewis and Clark Lake in 2003 increased to 3.2 years (Table 12). Age and growth analysis revealed that large year-classes were produced in 2000 and 2001, which remain well represented in the population at age-3 and age-2, respectively ( Table 6). Seven age-groups were represented in the sample and ranged in total length from 130 mm to 534 mm (Figure 4). Sauger PSD increased to 93 in 2003 (Table 7), the result of a large 2001 year-class growing past quality length. Mean Wr values for 2003 were in the range of the five-year period (Table 8). Total length-weight regression equations for sauger are provided in Appendix 3.

Annual survival for 2002-2003 pooled sauger data was 65% (Table 9), as estimated from catch curve analysis (r'=0.71; Ricker 1975) and excluding age-0 fish. Annual survival increased from that estimated for 2001-2002 pooled data and was the highest since 1998-1999 pooled data, similar to walleye.

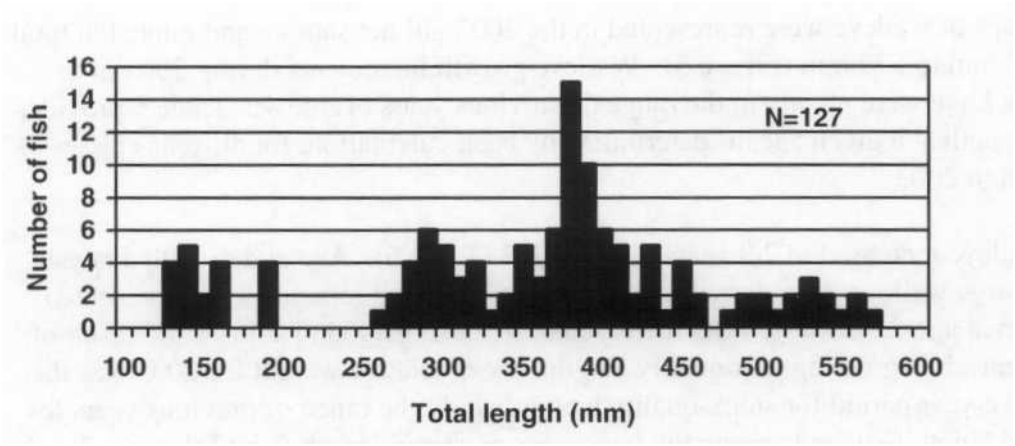


Figure 3. Length frequency of walleye collected with gill nets from Lewis and Clark Lake during September 2003. N is the sample size.

Table 4. Mean annual growth increments (mm) of back-calculated total lengths for each year-class of walleye collected with gill nets from Lewis and Clark Lake in 2003

| Year class | Age | N | Growth period (ages) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10 11 |
| 2002 | 1 | 24 | 146 | | | | | | | | | | |
| 2001 | 2 | 52 | 173 | 136 | | | | | | | | | |
| 2000 | 3 | 10 | 165 | 166 | 63 | | | | | | | | |
| 1999 | 4 | 6 | 163 | 154 | 94 | 40 | | | | | | | |
| 1998 | 5 | 5 | 157 | 145 | 94 | 78 | 40 | | | | | | |
| 1997 | 6 | 1 | 169 | 101 | 101 | 99 | 26 | 17 | | | | | |
| 1996 | 7 | 2 | 177 | 159 | 73 | 47 | 36 | 20 | 15 | | | | |
| 1995 | 8 | 4 | 145 | 182 | 55 | 30 | 42 | 24 | 14 | 13 | | | |
| 1994 | 9 | 3 | 141 | 141 | 97 | 33 | 35 | 38 | 23 | 18 | 14 | | |
| 1992 | 11 | 1 | 110 | 205 | 29 | 43 | 15 | 30 | 23 | 20 | 8 | 7 | 8 |
| Population mean | | | 155 | 154 | 76 | 53 | | 26 | 19 | 17 | 11 | 7 | 8 |
| Sample size | | | 1 1 ) | 84 | 32 | 22 | 16 | 11 | 10 | 8 | 4 | | 1 |

Table 5. Mean back-calculated total lengths (mm) at annulus for each year-class of walleye collected with gill nets from Lewis and Clark Lake in 2003.

| Year class | Age | N | Back-calculation age | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **1** | **2** | **3** | **4** | **5** | | 7 | **8** | **9** | **10** | **11** |
| 2002 | 1 | 24 | 146 | | | | | | | | | | |
| 2001 | 2 | 52 | 173 | 309 | | | | | | | | | |
| 2000 | 3 | 10 | 165 | 331 | 394 | | | | | | | | |
| 1999 | 4 | 6 | 163 | 317 | 411 | 451 | | | | | | | |
| 1998 | 5 | 5 | 157 | 302 | 396 | 474 | 514 | | | | | | |
| 1997 | 6 | 1 | 169 | 270 | 371 | 470 | 496 | 513 | | | | | |
| 1996 | 7 | 2 | 177 | 336 | 409 | 456 | 492 | 512 | 527 | | | | |
| 1995 | 8 | 4 | 145 | 327 | 382 | 412 | 454 | 478 | 492 | 505 | | | |
| 1994 | 9 | 3 | 141 | 282 | 379 | 412 | 447 | 485 | 508 | 526 | 540 | | |
| 1992 | 11 | 1 | 110 | 315 | 344 | 387 | 402 | 432 | 455 | 475 | 483 | 490 | 498 |
| Population mean | | | 155 | 310 | 386 | 437 | 468 | 484 | 495 | 502 | 511 | 490 | 498 |
| Sample size | | | 112 | 84 | 32 | 22 | 16 | 11 | 10 | 8 | 4 | | 1 |

Table 6. ARe distribution of walleye collected with gill nets from Lewis and Clark Lake, 1999-2003. Mean age excludes age-0 fish.

| | Age | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **Mean** |
| 1999 | 5 | 23 | 4 | 5 | 2 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 2.2 |
| 2000 | 16 | 11 | 27 | 3 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 2.2 |
| 2001 | 79 | 18 | 10 | 26 | 2 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 2.6 |
| 2002 | 9 | 39 | 21 | 5 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.8 |
| 2003 | 10 | 24 | 52 | 10 | 6 | 5 | 1 | 2 | 4 | 3 | 0 | 1 | 2.8 |

Table 7. Walleye, sauger, and channel catfish proportional stock density (relative stock density of preferred and memorable-length fish) from lewis and Clark take gill net catches_ 1999-2003

| **Species** | **1999** | **2000** | **2001** | **2002** | **2003** |
|---|---|---|---|---|---|
| Walleye | 62(8,0) | 40(7,0) | 67 (10,0) | 42 (4,0) | 61 (11,0) |
| Sauger | 87 (60,1) | 80 (42,5) | 86 (61,6) | 76 (53,3) | 93 (62,2) |
| Channel catfish | 31 (12,0) | 47(5,2) | 43(8,2) | 70(3,0) | 64 (24,7) |

Table 8. Mean relative weight, by length category, for Lewis and Clark Lake walleye, sauger, and channel catfish collected with gill nets. N is the number of stock length fish. Standard errors are in parenthesis.

| Year | Stock-quality | Quality-preferred | Preferred | N |
|---|---|---|---|---|
| **Walleye** | | | | |
| 1999 | 86(0.6) | 85(2.4) | 81 (0.4) | 39 |
| 2000 | 81 (0.2) | 79(0.3) | 80(1.5) | 45 |
| 2001 | 85(0.6) | 87(0.5) | 85(0.9) | 63 |
| 2002 | 80(0.4) | 81 (0.7) | 84(1.0) | 76 |
| 2003 | 87(0.7) | 82(0.3) | 800.5) | 108 |
| **Sauger** | | | | |
| 1999 | 780.5) | 79(1.2) | 77(0.7) | 70 |
| 2000 | 77(1.0) | 80(0.7) | 75(2.0) | 57 |
| 2001 | 80(0.7) | 84(0.8) | 80(0.6) | 95 |
| 2002 | 77(0.8) | 78(0.5) | 78(0.7) | 102 |
| 2003 | 79(1.4) | 80(0.6) | 79(0.8) | 84 |
| **Channel catfish** | | | | |
| 1999 | 84(0.8) | 82(1.3) | 93(2.9) | 42 |
| 2000 | 87(0.8) | 86(1.1) | 80(5.4) | 43 |
| 2001 | 87(0.6) | 86(1.4) | 89(7.4) | 53 |
| 2002 | 85(1.7) | 85(1.4) | 84(0.0) | 33 |
| 2003 | 86(1.6) | 88(2.0) | 88(4.1) | 29 |

Table 9. Catch curve estimates of annual survival (S), annual mortality (A), instantaneous mortality rates (-Z), and coefficient of determination (r) for age-1 and older fish. Survival and mortality estimates for channel catfish are for age-3 and older fish. Years indicate which annual gill net surveys were combined for analysis.

| **Species** | **Years** | **S** | **A** | **-Z** | $r^2$ |
|---|---|---|---|---|---|
| Walleye | 1998-1999 | 0.78 | 0.22 | 0.218 | 0.29 |
| | 1999-2000 | 0.62 | 0.38 | 0.483 | 0.79 |
| | 2000-2001 | 0.62 | 0.38 | 0.473 | 0.74 |
| | 2001-2002 | 0.53 | 0.47 | 0.638 | 0.93 |
| | 2002-2003 | 0.66 | 0.34 | 0.422 | 0.75 |
| Sauger | **1998-1999** | 0.69 | 0.31 | 0.375 | 0.60 |
| | 1999-2000 | 0.61 | 0.39 | 0.496 | 0.66 |
| | 2000-2001 | 0.64 | 0.36 | 0.453 | 0.75 |
| | 2001-2002 | 0.57 | 0.43 | 0.570 | 0.90 |
| | 2002-2003 | 0.65 | 0.35 | 0.428 | 0.71 |
| Channel catfish | 2000 | 0.78 | 0.22 | 0.254 | 0.56 |
| | 2000-2001 | 0.69 | 0.31 | 0.377 | 0.96 |
| | 2003 | 0.85 | 0.15 | 0.163 | 0.59 |

Table 10. Mean annual growth increments (min) of hack-calculated total lengths for each year-class of sauger collected with gill nets from Lewis and Clark Lake in 2003

| **Year class** | **Age** | **N** | **Growth period (ages)** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **0-1** | **1-2** | **2-3** | **3-4** | **4-5** | **5-6** |
| 2002 | 1 | 6 | 136 | | | | | |
| 2001 | 2 | 20 | 183 | 127 | | | | |
| 2000 | 3 | 28 | 154 | 182 | 45 | | | |
| **1999** | 4 | 13 | 179 | 137 | 79 | 47 | | |
| **1998** | 5 | 12 | 164 | 140 | 60 | 29 | 19 | |
| **1997** | 6 | 3 | 173 | 81 | 93 | 38 | 32 | 21 |
| Population mean | | | 165 | 133 | 70 | 38 | 26 | 21 |
| Sample size | | 82 | 82 | 76 | 56 | 28 | 15 | 3 |

Table 11. Mean back-calculated total lengths (mm) at annulus for each year-class of sauger collected with gill nets from Lewis and Clark Lake in 2003.

| Year class | Age | N | Back-calculation age | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| 2002 | I | 6 | 136 | | | | | |
| 2001 | 2 | 20 | 183 | 310 | | | | |
| 2000 | 3 | 28 | 154 | 336 | 381 | | | |
| 1999 | 4 | 13 | 179 | 316 | 395 | 442 | | |
| 1998 | 5 | 12 | 164 | 304 | 364 | 393 | 412 | |
| 1997 | 6 | 3 | 173 | 254 | 347 | 385 | 417 | 438 |
| Population mean | | | 165 | 304 | 372 | 407 | 414 | 438 |
| Sample size | | 82 | 82 | 76 | 56 | 28 | 15 | 3 |

Table 12. Age distribution of sauger collected with gill nets from Lewis and Clark Lake, 1999-2003. Mean age excludes age-0 Fish.

| Year | Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Mean |
| 1999 | 2 | 10 | 19 | 21 | 16 | 2 | 2 | 0 | 2.8 |
| 2000 | 15 | 12 | 18 | 14 | 8 | 5 | 0 | 0 | 2.6 |
| 2001 | 78 | 21 | 17 | 27 | 9 | 8 | 3 | 0 | 2.7 |
| 2002 | 5 | 34 | 32 | 6 | 23 | 4 | 1 | 2 | 2.4 |
| 2003 | 1 | 6 | 20 | 28 | 13 | 12 | 3 | 0 | 3.2 |

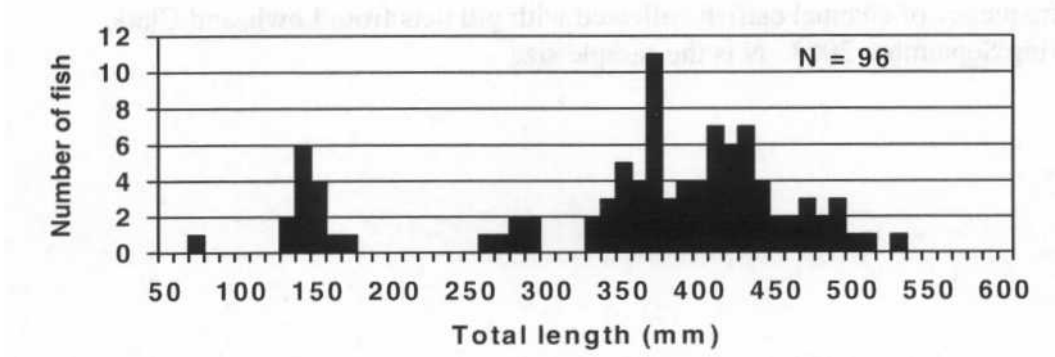


Figure 4. Length frequency of sauger collected with gill nets from Lewis and Clark Lake during September 2003. N is the sample size.

Channel Catfish Population Parameters

Channel catfish gill net CPUE in Lewis and Clark Lake continued to decline from a five-year high in 2001 to the lowest of the five-year period in 2003 (Table 3). Total length ranged from 300 mm to 726 mm (Figure 5), and PSD decreased from 70 in 2002 to 64 in 2003 (Table 7). Mean relative weights were highest of the five-year period for quality-preferred length fish and in the range of previous years for stock-quality and preferred length fish (Table 8).

Incremental growth during 2002 was similar to previous years for most growth periods (Table 13). Length at given age, as determined by back-calculation, is provided in Table 14. Total length-weight regression equations are provided in Appendix 3. Estimated annual survival rate for 2003 was quite high at *85%* (Table 9).

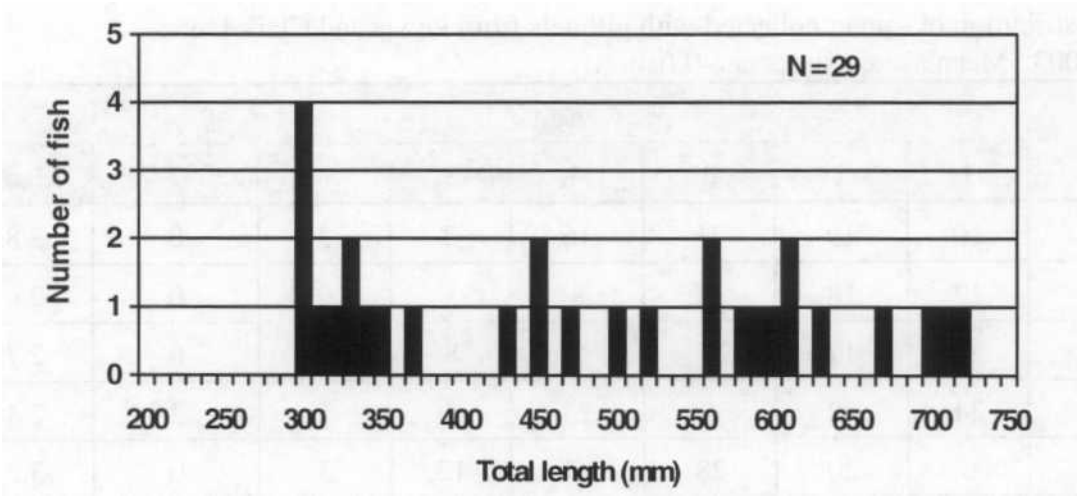


Figure 5. Length frequency of channel catfish collected with gill nets from Lewis and Clark Lake during September 2003. N is the sample size.

Table 13. Mean annual growth increments (mm) of back-calculated total lengths for each year-class of channel catfish collected with (ill nets from Lewis and Clark Lake in 2003.

| Year class | Age | N | Growth period (ages) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10-11 | 11-12 | 12-13 | 13 14 |
| 2001 | 2 | I | 120 | 90 | | | | | | | | | | | | |
| 2000 | 3 | 9 | 89 | 80 | 74 | | | | | | | | | | | |
| 1998 | 5 | 4 | 104 | 107 | 62 | 57 | 56 | | | | | | | | | |
| 1997 | 6 | 3 | 113 | 97 | 91 | 61 | 45 | 45 | | | | | | | | |
| 1996 | 7 | 1 | 98 | 90 | 45 | 67 | 68 | 90 | 22 | | | | | | | |
| 1995 | 8 | 3 | 133 | 102 | 71 | 71 | 63 | 48 | 47 | 34 | | | | | | |
| 1994 | 9 | 1 | 150 | 96 | 72 | 72 | 24 | 48 | 48 | 24 | 24 | | | | | |
| 1993 | 10 | 2 | 126 | 65 | 75 | 44 | 53 | 53 | 43 | 22 | 43 | 22 | | | | |
| 1992 | 11 | 1 | 124 | 95 | 94 | 47 | 71 | 71 | 47 | 47 | 47 | 24 | 23 | | | |
| 1991 | 12 | 2 | 135 | 114 | 51 | 63 | 26 | 51 | 25 | 38 | 37 | 37 | 26 | 25 | | |
| 1990 | 13 | 1 | 123 | 116 | 69 | 47 | 46 | 47 | 46 | 46 | 47 | 23 | 23 | 23 | 24 | |
| 1989 | 14 | 1 | 135 | 84 | 63 | 42 | 83 | 63 | 42 | 21 | 21 | 21 | 21 | 21 | 42 | 21 |
| Population | | | 121 | 94 | 61 | 61 | 54 | 58 | 42 | 35 | 32 | 27 | 36 | 3 | 35 | 21 |
| Sample size | | | 29 | 29 | 28 | 19 | 19 | 15 | 12 | 11 | 8 | | | 4 | 2 | 1 |

Table 14. Mean back-calculated total lengths (mm) at annulus for each year-class of channel catfish collected with till nets from Lewis and Clark Lake in 2003.

| Year class | Age | N | Back-calculation age | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 4 | 5 | 6 | | | 9 | 10 | 11 | 12 | 13 | 14 |
| 2001 | | 1 | 120 | 210 | | | | | | | | | | | | |
| 2000 | 3 | 9 | 89 | 169 | 243 | | | | | | | | | | | |
| 1998 | 5 | 4 | 104 | 211 | 273 | 330 | 386 | | | | | | | | | |
| 1997 | 6 | 3 | 113 | 210 | 301 | 362 | 407 | 452 | | | | | | | | |
| 1996 | 7 | 1 | 98 | 188 | 233 | 300 | 368 | 458 | 480 | | | | | | | |
| 1995 | 8 | 3 | 133 | 235 | 306 | 377 | 440 | 488 | 535 | 566 | | | | | | |
| 1994 | 9 | 1 | 150 | 246 | 318 | 390 | 414 | 462 | 510 | 534 | 558 | | | | | |
| 1993 | 10 | 2 | 126 | 191 | 266 | 310 | 363 | 416 | 459 | 481 | 524 | 546 | | | | |
| 1992 | 11 | 1 | 124 | 219 | 313 | 360 | 431 | 502 | 549 | 596 | 643 | 667 | 690 | | | |
| 1991 | 12 | 2 | 135 | 249 | 300 | 363 | 389 | 440 | 465 | 503 | 540 | 577 | 603 | 628 | | |
| 1990 | 13 | 1 | 123 | 239 | 308 | 355 | 401 | 448 | 494 | 540 | 587 | 610 | 633 | 656 | 680 | |
| 1989 | 14 | 1 | 135 | 219 | 282 | 324 | 407 | 470 | 512 | 533 | 554 | 575 | 596 | 617 | 659 | 680 |
| Population mean | | | " | 215 | 286 | 347 | 401 | 459 | 501 | 536 | 568 | 595 | 631 | 634 | 669 | 680 |
| Sample size | | | 29 | 29 | 28 | 19 | 19 | 15 | 12 | 11 | 8 | 7 | 5 | | 2 | 1 |

LEWIS AND CLARK LAKE -ELECTROFISHING

Smallmouth Bass Population Parameters

A total of 25 smallmouth bass were sampled during nighttime electrofishing in Lewis and Clark Lake, near Gavins Point Dam, during late May 2003. A CPUE of 25.0 fish/h was the second lowest recorded for Lewis and Clark Lake during the five-year period (Table 15). Smallmouth bass PSD at 48 was the second highest recorded. Relative weights were 90 or higher in 2003.

Growth increments for all growth periods of smallmouth bass in Lewis and Clark Lake during 2002 were mostly in the range of previous years (Table 16). Mean lengths achieved during 2002, as determined by back-calculation, were also in the range of previous years (Table 17). Population mean total lengths were longer than means reported by Willis et al. (2001) for statewide South Dakota waters and Missouri River reservoirs. Mean age increased to 3.2 years and was the highest of the five-year period (Table 18). Smallmouth bass along Gavins Point Dam ranged in length from 155 mm to 466 mm (Figure 6). Total length-weight regression equations are provided in Appendix 3.

Smallmouth bass annual survival estimated from catch curve analysis (Ricker 1975) for 2002 and 2003 pooled data, using age-2 and older fish numbers, was 49% with an r`' value of 0.88. Annual survival estimated for 2000-2001 and 2001-2002 pooled data were both 44%. Estimated annual survival the past few years has consistently been in the 40% to 50% range.

Table 15. Catch per unit effort (CPUE, standard error), proportional stock density (PSD), relative stock density for preferred and memorable-length fish (RSD-P and RSD-M respectively), and relative weights (standard error) of stock-quality (S-Q), quality-preferred (Q-P), and preferred-length (P) fish for smallmouth bass collected by electrofishing Lewis and Clark Lake. N is the number of stock-length fish sampled.

| Year | CPUE (fish/h) | PSD | RSD-P | RSD-M | Relative weight | | | N |
|---|---|---|---|---|---|---|---|---|
| | | | | | S-Q | Q-P | P | |
| 1999 | 67.0(11.4) | 17 | 3 | 0 | 91(1.3) | 87(2.8) | 81(6.0) | 64 |
| 2000 | 21.0(6.9) | 39 | 17 | 0 | 97(1.6) | 91(2.2) | 92(0.0) | 18 |
| 2001 | 59.0(9.5) | 17 | 4 | 0 | 94(0.5) | 84(0.6) | 87(5.6) | 54 |
| 2002 | 75.0(12.5) | 49 | 11 | 3 | 92(0.9) | 88(0.9) | 93(2.5) | 70 |
| 2003 | 25.0(8.0) | 48 | 22 | 9 | 90(1.6) | 91(1.9) | 100(1.3) | 23 |

Table 16. Mean annual growth increments (mm) of back-calculated total lengths (mm) for each year-class of smallmouth bass collected by electrofishing Lewis and Clark Lake near Gavins Point Dam during May 2003.

| Year class | Age | N | Growth period (ages) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 |
| 2001 | 2 | 9 | 98 | 93 | | | | | |
| 2000 | 3 | | 88 | 99 | 77 | | | | |
| 1999 | 4 | 1 | 113 | 49 | 90 | 82 | | | |
| 1998 | 5 | 5 | 103 | 127 | 69 | 61 | 29 | | |
| 1996 | 7 | 1 | 99 | 134 | 35 | 69 | 60 | 48 | 19 |
| Population mean | | | 100 | 100 | 68 | 71 | 45 | 48 | 19 |
| Sample size | | 24 | 24 | 24 | 15 | 7 | 6 | 1 | 1 |

Table 17. Mean back-calculated total lengths (mm) at annulus for each year-class of smallmouth bass collected by electrofishing Lewis and Clark Lake near Gavins Point Dam during May 2003.

| Year class | Age | N | Back-calculation age | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2001 | 2 | 9 | 98 | 191 | | | | | |
| 2000 | 3 | 8 | 88 | 187 | 264 | | | | |
| 1999 | 4 | 1 | 113 | 162 | 252 | 334 | | | |
| 1998 | 5 | 5 | 103 | 230 | 299 | 360 | 389 | | |
| 1996 | 7 | 1 | 99 | 233 | 268 | 337 | 397 | 445 | 464 |
| Population mean | | | 100 | 201 | 271 | 343 | 393 | 445 | 464 |
| Sample size | | 24 | 24 | 24 | 15 | 7 | 6 | 1 | 1 |

Table 18. Age distribution of smallmouth bass collected by electrofishing Lewis and Clark Lake near Gavins Point Dam, 1999-2003. Mean age excludes age-0 fish.

| Year | Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Mean |
| 1999 | 3 | 38 | 18 | 6 | 2 | 0 | 0 | 2.5 |
| 2000 | 2 | 8 | 6 | 2 | 1 | 2 | 0 | 2.9 |
| 2001 | 4 | 45 | 4 | 5 | 1 | 0 | 0 | 2.2 |
| 2002 | 2 | 29 | 33 | 5 | 1 | 5 | 0 | 2.9 |
| 2003 | 0 | 10 | 8 | 1 | 5 | 0 | 1 | 3.2 |

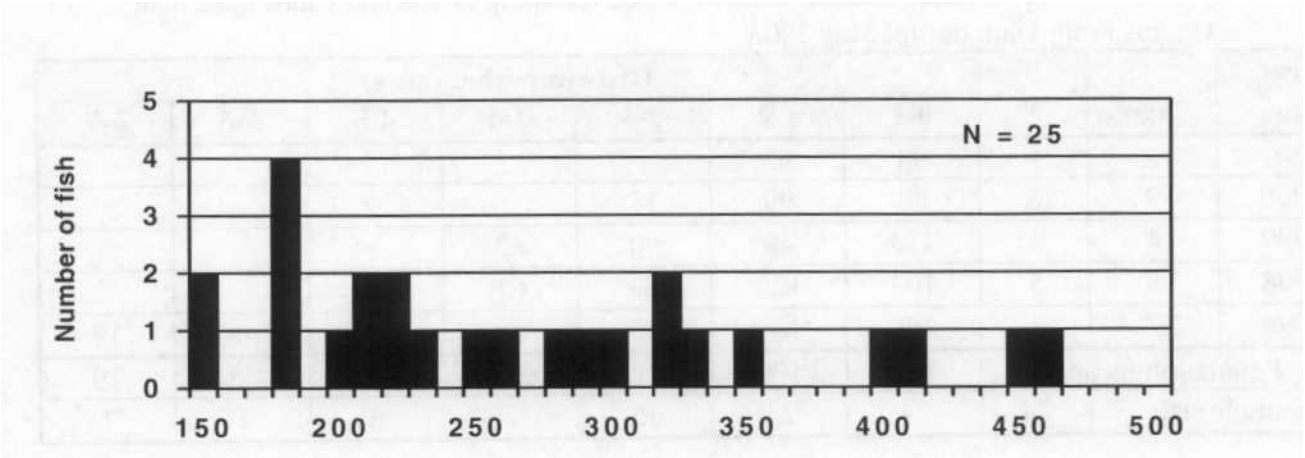


Figure 6. Length frequency of smallmouth bass collected by electrofishing Lewis and Clark Lake near Gavins Point Dam during May 2003. N is the sample size.

Flathead Catfish Population Parameters

Daytime electrofishing along the south shoreline of Lewis and Clark Lake during 2002 produced a total of 57 flathead catfish for a CPUE of 21.6 fish/h (Table 19). The higher daily catch rate, 26.3 fish/h, occurred on June 17, at a surface water temperature of 23C (Table 20). One repeat capture was made on June 24 of a flathead catfish previously sampled on June 17.

Flathead catfish PSD for 2003 increased to 30, after a five-year low of 18 in 2002 (Table 19). Mean relative weights in 2003 were less than 2002 for stock-quality length fish and similar to 2002 for quality-preferred length fish. No preferred-length fish was captured in 2003, similar to the previous four years. Flathead catfish total length ranged from 81 mm to 595 mm (Figure 7). Ten year-classes of flathead catfish were present in the 2003 sample (Table 21). Total length-weight regression equations are provided in Appendix 3.

Growth increments of flathead catfish during 2002 were in the range of previous years, except for fish in the age 5-6 growth period which were higher than previous years. (Table 22). Mean total lengths reached by flathead catfish in Lewis and Clark Lake, as determined by back-calculation, are presented in Table 23. Mean total lengths for age-3 through age-5 fish are less than that attained by flathead catfish in the lower Mississippi River (Mayo and Schramm 1999).

Flathead catfish annual survival estimated from catch curve analysis (Ricker 1975) of 2002-2003 pooled catch data was *64%* with an $r^2$ value of 0.89. Catch numbers of age-3 and older fish were utilized for survival estimation because flathead catfish in Lewis and Clark Lake apparently were not fully susceptible to electrofishing gear until age-3. Annual survival estimated for 2001-2002 pooled catch data was *55%* and for 2000-2001 pooled catch data was 53%, using age-3 and older fish numbers for the calculations ( Wickstrom 2003).

Table 19. Catch per unit effort (CPUE, standard error), proportional stock density (PSD), relative stock density for preferred and memorable length fish (RSD-P and RSD-M respectively), and relative weights (standard error) of stock-quality (S-Q), quality-preferred (Q-P), and preferred-length (P) fish for flathead catfish collected by electrofishing Lewis and Clark Lake. N is the number of stock-length fish sampled.

| Year | CPUE (fish/h) | PSD | RSD-P | RSD-M | Relative weight | | | N |
|---|---|---|---|---|---|---|---|---|
| | | | | | S-Q | Q-P | P | |
| 1999 | 21.4 (5.3) | 38 | 0 | 0 | 89(2.0) | 95(1.9) | | 26 |
| 2000 | 18.2 (3.6) | 38 | 0 | 0 | 93(0.8) | 91(0.0) | - | 21 |
| 2001 | 28.0 (9.8) | 34 | 0 | 0 | 85(1.0) | 88(2.0) | | 25 |
| 2002 | 36.0 (9.3) | 18 | 0 | 0 | 91(0.7) | 88(1.5) | - | 48 |
| 2003 | 21.6 (4.1) | 30 | 0 | 0 | 85(1.7) | 91(2.5) | - | 30 |

Table 20. Catch statistics for flathead catfish collected by electrofishing Lewis and Clark Lake during June 2003. Standard error is in parenthesis.

| Date | Fish/h | Mean length (mm) | Water temperature |
|---|---|---|---|
| June 17 | 26.3 (12.8) | 276(112.2) | 23 C |
| June 24 | 17.5 (9.8) | 311 (154.2) | 24 C |
| Mean | 21.6 (4.1) | 289 (129.4) | |

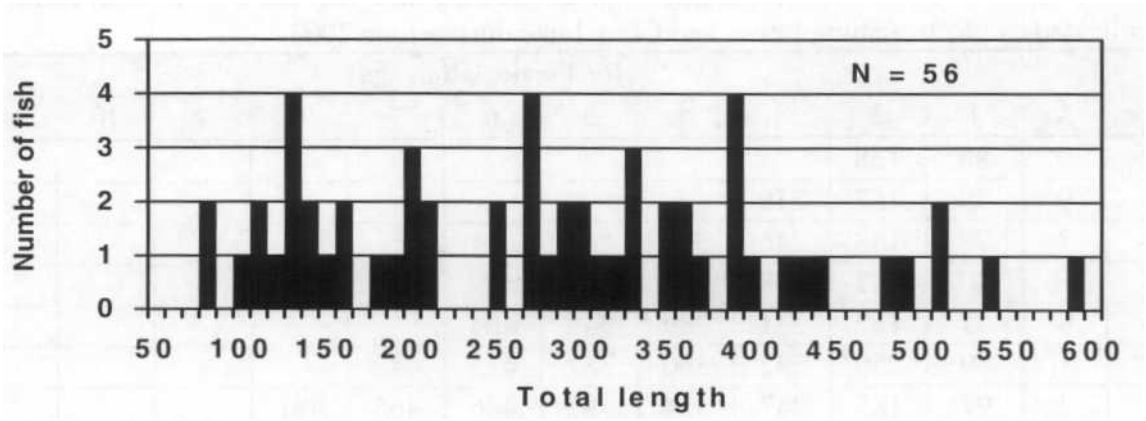


Figure 7. Length frequency of flathead catfish collected by electrofishing Lewis and Clark Lake during June 2003. N is the sample size.

Table 21. Age distribution of flathead catfish collected by electrofishing Lewis and Clark Lake during 2000-2003.

| Year class | Age | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Mean |
| 2000 | 0 | 0 | 16 | 9 | 8 | 0 | 0 | 1 | 0 | 0 | 1.9 |
| 2001 | 0 | 3 | 23 | 24 | 5 | 9 | 2 | 0 | 2 | 0 | 4.1 |
| 2002 | 7 | 11 | 12 | 34 | 16 | 1 | 5 | 2 | 0 | 1 | 3.9 |
| 2003 | 5 | 9 | 9 | 7 | II | 9 | 1 | 2 | 2 | 1 | 4.2 |

Table 22. Mean annual growth increments (mm) of back-calculated lengths for each year-class of flathead catfish collected by electrofishing Lewis and Clark Lake during June 2003

| Year class | Age | N | Growth period (ages) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | 10-11 |
| 2001 | 2 | 9 | 86 | 72 | | | | | | | | | |
| 2000 | 3 | 9 | 79 | 78 | 62 | | | | | | | | |
| 1999 | 4 | 7 | 78 | 70 | 98 | 56 | | | | | | | |
| 1998 | 5 | 11 | 80 | 67 | 61 | 77 | 63 | | | | | | |
| 1997 | 6 | 9 | 91 | 76 | 54 | 68 | 55 | 60 | | | | | |
| 1996 | 7 | 1 | 99 | 151 | 82 | 28 | 27 | 28 | 27 | | | | |
| 1995 | 8 | 2 | 97 | **88** | 62 | 77 | 73 | 29 | 39 | 26 | | | |
| 1994 | 9 | 1 | 123 | 63 | 93 | 94 | 78 | 31 | 15 | 16 | 31 | | |
| 1992 | 11 | 1 | 65 | 106 | 71 | 71 | 70 | 53 | 53 | 35 | 18 | 19 | 17 |
| Population mean | | | 89 | 86 | 73 | 67 | 61 | 40 | 34 | 26 | 25 | 19 | 17 |
| Sample size | | 50 | 50 | 50 | 41 | 32 | 25 | 14 | 5 | 4 | 2 | 1 | 1 |

Table 23. Mean back-calculated total lengths (mm) at annulus for each year-class of flathead catfish collected by electrofishing Lewis and Clark Lake during June 2003.

| Year class | Age | N | Back-calculation age | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | | 7 | 8 | 9 | 10 | 11 |
| 2001 | | 9 | 86 | 158 | | | | | | | | | |
| 2000 | 3 | 9 | 79 | 157 | 219 | | | | | | | | |
| 1999 | 4 | 7 | 78 | 148 | 246 | 302 | | | | | | | |
| 1998 | 5 | **11** | 80 | 147 | 208 | 285 | 348 | | | | | | |
| 1997 | 6 | 9 | 91 | 167 | 221 | 289 | 344 | 404 | | | | | |
| 1996 | 7 | 1 | 99 | 250 | 332 | 360 | 387 | 415 | 442 | | | | |
| 1995 | 8 | 2 | 97 | 185 | 247 | 324 | 397 | 426 | 465 | 491 | | | |
| 1994 | 9 | 1 | 123 | 186 | 279 | 373 | 451 | 482 | 497 | 513 | 544 | | |
| 1992 | 11 | 1 | 65 | 171 | 242 | 313 | 383 | 436 | 489 | 524 | 542 | 560 | 577 |
| Population mean | | | 89 | 174 | 249 | 321 | 385 | 432 | 473 | 509 | 543 | 560 | 577 |
| Sample size | | 50 | 50 | 50 | 41 | 32 | 25 | 14 | 5 | 4 | 2 | 1 | 1 |

MISSOURI RIVER-ELECTROFISHING

LARGEMOUTH BASS POPULATION PARAMETERS

Samples of largemouth bass obtained from two stretches of Missouri River (river miles 829, 833, 834 and 845-846) were combined for population form and function documentation, as was done with 1996-2001 data. The electrofishing catch rate of 32.5 fish/h in 2003 was the highest documented in this Missouri River reach (Table 24; Wickstrom 1998). However, the vast majority of the fish sampled were from the 2003 year-class (25 fish/h, Table 25). Largemouth bass sampled in 2003 ranged in total length from 65 mm to 448 mm (Figure 8). A **PSD** value of 57 was an increase over 2000 and 2001, the most recent years previously sampled (Table 26). Relative weights were in the range of previous years (Table 27).

Incremental growth of largemouth bass during 2002 was in the range of previous years, except for growth periods 3-4 and 5-6 which were significantly lower (Table 28). Mean lengths at each age for all year-classes, as determined by back-calculation, are presented in Table 29. Except for fish at age-I and 2, population mean total lengths for each age were greater than the South Dakota mean (Willis et al. 2001) . A total length-weight regression equation is provided in Appendix 3.

Estimated annual survival, calculated from catch curve analysis (Ricker 1975), for 2003 data was 70%, with an associated r' value of 0.70. This was similar to 68% annual survival estimated for 2000-2001 pooled data and 69% for 2000 data (Wickstrom 2002).

Table 24. Spring electrofishing catches (fish/h) for the Missouri River near Springfield, SD during 1998-2003 (standard error).

| Species | 1998 | 1999 | 2000 | 2001 | 2003 |
|---|---|---|---|---|---|
| Largemouth bass | 13.1(2.9) | 21.2(7.3) | 16.9 (6.4) | 12.0 (0.0) | 32.5 (11.5) |
| Smallmouth bass | 8.1(2.4) | 15.9(5.4) | 9.0 (1.3) | 5.5 (0.5) | 15.0 (5.6) |

Table 25. Age distribution of largemouth bass collected by electrofishing the Missouri River near Springfield, SD 1998-2003.

| Year class | Age | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | 7 | **8** | **9** | **10** | **Mean** |
| 1998 | 0 | 1 | 7 | 7 | 6 | 5 | 0 | 1 | 0 | 3 | *5.2* |
| 1999 | 22 | 1 | 2 | 2 | 4 | 2 | 4 | 5 | 0 | 0 | 3.3 |
| 2000 | 23 | 12 | 4 | 0 | 1 | 3 | 0 | 0 | 1 | 0 | 2.1 |
| 2001 | 0 | 0 | 3 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 4.9 |
| 2003 | 60 | 14 | 5 | 2 | 2 | 4 | 3 | 2 | 1 | 0 | 2.3 |

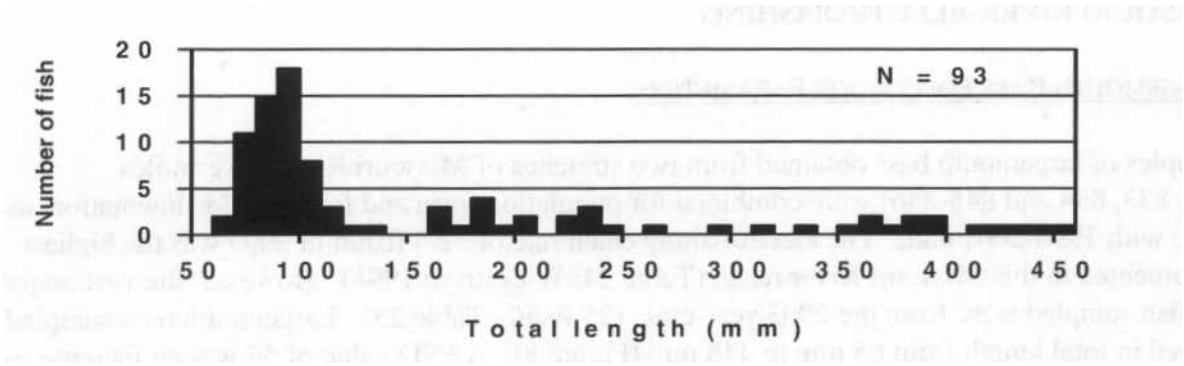


Figure 8. Length frequency of largemouth bass collected by electrofishing the Missouri River near Springfield, SD during May 2003. N is the sample size.

Table 26. Proportional stock density and relative stock density of preferred and memorable-length fish (in parenthesis) collected by electrofishing the Missouri River near Springfield. SD. N is the number of stock-length fish sampled.

| Species | 1998 | 1999 | 2000 | 2001 | 2003 |
|---|---|---|---|---|---|
| Largemouth bass | 94 (39,0) N=31 | 74 (53.0) N=19 | 44 (19,0) N=16 | 43 (43,0) N=7 | 57(30.0) N=23 |
| Smallmouth bass | 94 (56,19) N=32 | 100 (50,17) N=30 | 75 (50,17) N=12 | 89 (44,0) N=9 | 87 (47,20) N=15 |

Table 27. Mean relative weight, by length category, for fish collected by electrofishing the Missouri River near Springfield, SD (standard error). N is the number of stock-length fish

| Year | Stock-quality | Quality preferred | Preferred | N |
|---|---|---|---|---|
| **Largemouth bass** | | | | |
| 1998 | 108(1.0) | 107(1.7) | 106(2.3) | 31 |
| 1999 | 124(8.3) | 105(5.6) | 104(2.7) | 19 |
| 2000 | 112(2.0) | 113(5.9) | 107(9.3) | 16 |
| 2001 | 95(2.6) | 101(0.0) | 100(6.1) | 7 |
| 2003 | 111(2.3) | 104(1.4) | 102(6.0) | 23 |
| **Smallmouth bass** | | | | |
| 1998 | 85(1.0) | 101(2.8) | 97(2.1) | 32 |
| 1999 | | 96(1.5) | 94(2.3) | 30 |
| 2000 | 102(2.9) | 96(2.7) | 92(4.7) | 12 |
| 2001 | 90(0.0) | 96(2.6) | 91(1.8) | 9 |
| 2003 | 101(0.9) | 98(1.7) | 90.1(4.6) | 15 |

Table 28. Mean annual increments (min) of back-calculated total lengths for each year class of largemouth bass collected by electrofishing the Missouri River near Springfield, SD during May 2003.

| Year | | | Growth period (ages) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| class | Age | N | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 |
| 2002 | 1 | 11 | 105 | | | | | | | |
| 2001 | 2 | 14 | 82 | 108 | | | | | | |
| 2000 | 3 | 5 | 66 | 114 | 63 | | | | | |
| 1999 | 4 | 2 | 70 | 76 | 95 | 51 | | | | |
| 1998 | 5 | 2 | 90 | 124 | 87 | 36 | 25 | | | |
| 1997 | 6 | 4 | 71 | 101 | 90 | 47 | 39 | 20 | | |
| 1996 | 7 | 3 | 84 | 73 | 111 | 74 | 43 | 14 | 12 | |
| 1995 | 8 | 2 | 83 | 99 | 68 | 66 | 50 | 21 | 20 | 10 |
| Population mean | | | 81 | 99 | 86 | 55 | 39 | 18 | 16 | 10 |
| Sample size | | 43 | 43 | 32 | 18 | 13 | 11 | 9 | 5 | 2 |

Table 29. Mean back-calculated total lengths (mm) at annulus for each year-class of largemouth bass collected by electrofishing the Missouri River near Springfield, SD during May 2003.

| Year | | | Back-calculation age | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| class | Age | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 2002 | 1 | 11 | 105 | | | | | | | |
| 2001 | 2 | 14 | 82 | 190 | | | | | | |
| 2000 | 3 | 5 | 66 | 180 | 243 | | | | | |
| 1999 | 4 | 2 | 70 | 146 | 241 | 292 | | | | |
| 1998 | 5 | 2 | 9 | 214 | 301 | 337 | 362 | | | |
| 1997 | 6 | 4 | 71 | 172 | 262 | 309 | 348 | 368 | | |
| 1996 | 7 | 3 | 84 | 157 | 268 | 342 | 385 | 399 | 411 | |
| 1995 | 8 | 2 | 83 | 182 | 250 | 316 | 366 | 387 | 407 | 417 |
| Population mean | | | 81 | 177 | 261 | 319 | 365 | 385 | 409 | 417 |
| Sample size | | 43 | 43 | 32 | 18 | 13 | 11 | 9 | 5 | 2 |

Smallmouth Bass Population Parameters

Missouri River Smallmouth Bass

Smallmouth bass samples were obtained in 2003 from two stretches of Missouri River (river miles 829 and 833 and river miles 845, 846, 848 and 852) and were combined for population form and function documentation, similar to 1996-2001. The 2003 catch rate of 15.0 fish/h was the highest documented since 1999 (Table 24), but the majority of the fish sampled were from the 2002 year-class (10 fish/h, Table 30). Smallmouth bass PSD of 87, from a sample of only 15 stock-length fish, was in the range of previous years (Table 26). Relative weights for 2003 were in the range of previous years, except for preferred-length fish which were the lowest of the five-year period (Table 27).

Incremental growth of smallmouth bass in the Missouri River during 2002 was higher than previous years for growth periods 2-3, 3-4, and 6-7 (Table 31). Mean lengths achieved by smallmouth bass during 2002 were mostly in the range of previous years (Table 32). Population mean total lengths at each age were greater than the regional mean (Willis et al. 2001). Smallmouth bass sampled in 2001 ranged in total length from 71 mm to 445 mm (Figure 9). Because of the preponderance of age-I fish in the sample, mean age decreased to 3.5, lowest of the five-year period (Table 30). Total length-weight regression equation is provided in Appendix 3.

Annual survival estimated from catch curve analysis (Ricker 1975) for 2003 data was 82%, with an associated $r^2$ value of 0.53. Annual survival for 2000 data was estimated at 84% and for 2000-2001 pooled data was estimated at 81 % (Wickstrom 2002).

Table 30. Age distribution of smallmouth bass collected by electrofishing the Missouri River near Springfield, SD **1998-2003.**

| **Year** | | | | | | | **Age** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **class** | **1** | **2** | **3** | **4** | **5** | **6** | 7 | **8** | **9** | **10** | **11** | **Mean** |
| 1998 | 0 | 0 | 9 | | 7 | 6 | 4 | 2 | 1 | 0 | 1 | 5.3 |
| 1999 | 2 | 0 | 5 | 11 | 5 | 0 | 2 | 3 | 0 | 1 | 1 | 4.8 |
| 2000 | 3 | 3 | 2 | 0 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 3.7 |
| 2001 | 0 | 0 | 5 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 5.7 |
| 2003 | 28 | 2 | 5 | 1 | 4 | 0 | 1 | 1 | 1 | 0 | 0 | 3.5 |

Table 3 1. Mean annual growth increments (mm) of back-calculated total lengths for each year-class of smallmouth bass collected by electrofishing the Missouri River near Springfield, SD during May 2003.

| Year | | | Growth period (ages) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **class** | **Age** | **N** | **0-1** | **1-2** | **2-3** | **3-4** | **4-5** | **5-6** | **6-7** | **7-8** | **8-9** |
| 2002 | 1 | 6 | 112 | | | | | | | | |
| 2001 | 2 | 2 | 103 | 107 | | | | | | | |
| 2000 | 3 | 5 | 95 | 112 | 107 | | | | | | |
| 1999 | 4 | 1 | 87 | 71 | 34 | 124 | | | | | |
| 1998 | 5 | 4 | 101 | 118 | 106 | 49 | 17 | | | | |
| 1996 | 7 | 1 | 115 | 102 | 112 | 33 | 20 | 31 | 29 | | |
| 1995 | 8 | 1 | 80 | 51 | 52 | 114 | 67 | 42 | 27 | 5 | |
| 1994 | 9 | 1 | 104 | 55 | 77 | 91 | 55 | 44 | 20 | 14 | 11 |
| Population mean | | | 100 | 88 | 81 | 82 | 28 | 39 | 25 | 10 | 11 |
| Sample size | | 21 | 21 | 15 | 13 | 8 | 7 | 3 | 3 | 2 | 1 |

Table 32. Mean back-calculated total lengths (mm) at annulus or each year-class of smallmouth bass collected by electrofishing the Missouri River near Springfield. SD during May 2003.

| Year | | | Back-calculation age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **class** | **Age** | **N** | **1** | **2** | **3** | **4** | **5** | **6** | 7 | **8** | 9 |
| 202 | 1 | 6 | 112 | | | | | | | | |
| 2001 | 2 | 2 | 103 | 210 | | | | | | | |
| 2000 | 3 | 5 | 95 | 207 | 300 | | | | | | |
| 1999 | 4 | 1 | 87 | 158 | 192 | 316 | | | | | |
| 1998 | 5 | 4 | 101 | 219 | 325 | 374 | 391 | | | | |
| 1996 | 7 | 1 | 115 | 217 | 329 | 362 | 382 | 413 | 442 | | |
| 1995 | 8 | 1 | 80 | 131 | 183 | 297 | 364 | 406 | 433 | 438 | |
| 1994 | 9 | 1 | 104 | 159 | 236 | 327 | 382 | 426 | 446 | 460 | 471 |
| Population mean | | | 100 | 186 | 261 | 335 | 380 | 415 | 440 | 449 | 471 |
| Sample size | | 21 | 21 | 15 | 13 | 8 | 7 | 3 | 3 | | 1 |

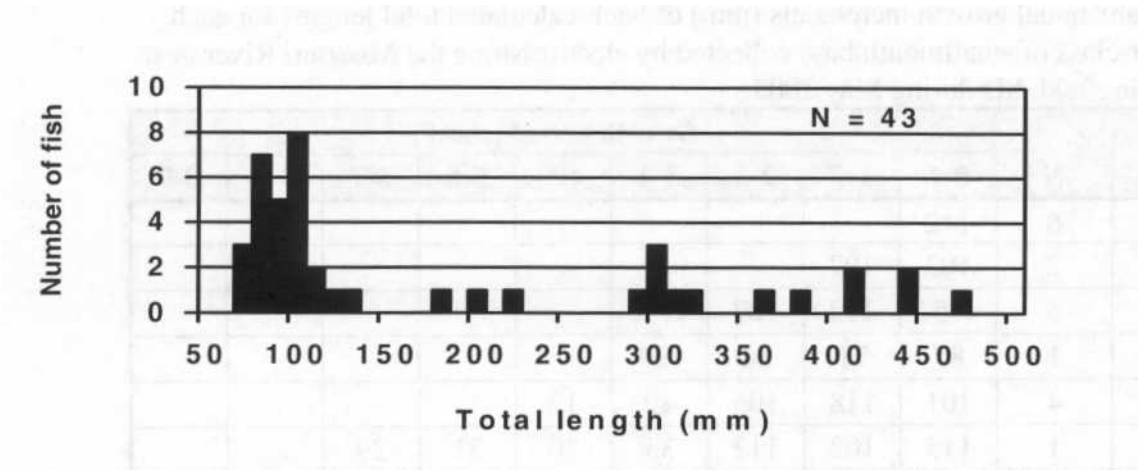


Figure 9. Length frequency of smallmouth bass collected by electrofishing the Missouri River near Springfield, SD during May 2003. N is the sample size.

Ft. Randall Tailwater Smallmouth Bass

Fall electrofishing the Missouri River below Ft. Randall Dam during 2003 produced a CPUE of 51 smallmouth bass/h, a decrease from last year (Table 33). However, 27 stock-length fish were sampled, which was an increase over last year. The PSD of 22 declined from 58 in 2002 to 22 in 2003, and was the lowest of the five-year period. A memorable-length fish was sampled for the second consecutive year. Mean $Wr$ in 2003 was lower than previous years for stock-quality and quality-preferred length fish, but was in the range of previous years for preferred length fish.

Growth increments of smallmouth bass in Ft. Randall tailwater during 2002 were among the lowest of all years indicated in Table 34. Mean total length at age for all year-classes, as determined by back-calculation, are presented in Table 35. Population mean total lengths for age-1 and older fish were greater than statewide means for South Dakota waters (Willis et al. 2001). Smallmouth bass sampled in 2003 ranged in length from 64 mm to 497 mm (Figure 10). A large year-class of smallmouth bass was produced in 2002 and contributed to a decline in mean age from 2002 to 2003 (Table 36). Total lengthweight regression equations for smallmouth bass in Ft. Randall tailwater are provided in Appendix 3.

Annual survival, estimated by catch curve analysis (Ricker 1975) for 2002-2003 pooled data and excluding age-0 fish, was 58%, with an associated $r^2$ value of 0.71. Estimated annual survival for 2000-2001 pooled data was 52% and for 2001-2002 pooled data was 66% (Wickstrom 2003).

Table 33. Catch per unit effort (CPUE, standard error), proportional stock density (PSD), relative stock density for preferred and memorable-length fish (RSD-P and RSD-M respectively), and relative weight (standard error) of stock-quality (S-Q), quality-preferred (Q-P), and preferred-length (P) fish for smallmouth bass collected by fall electrofishing the Missouri River below Ft. Randall Dam. N is the number of stock-length fish sampled.

| | CPUE | | | | | Relative | ht | |
|---|---|---|---|---|---|---|---|---|
| Year | (fish/h) | PSD | RSD-P | RSD-M | S-Q | Q-Pwes | P | N |
| 1999 | 58.6(1 1.1) | 36 | 8 | 0 | 104(1.7) | 100(2.6) | 101(2.1) | 36 |
| 2000 | 66.0(14.0) | 24 | 0 | 0 | 107(1.8) | 102(0.5) | | 25 |
| 2001 | 30.0(4.6) | 68 | 9 | 0 | 112(2.3) | 105(1.4) | 101(4.5) | 22 |
| 2002 | 91.0(21.7) | 58 | 26 | 5 | 106(2.3) | 99(2.6) | 93(2.6) | 19 |
| 2003 | 51.0(10.8) | 22 | 1 1 | 4 | 104(1.5) | 93(0.0) | 95(4.2) | 27 |

Table 34. Mean annual growth increments (mm) of back-calculated total lengths for each year-class of smallmouth bass collected by electrofishing the Missouri River below Ft. Randall Darn during October 2003.

| Year | | | Growth period (ages) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| class | Age | N | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 |
| 2002 | 1 | 22 | 97 | | | | | | | |
| 2001 | 2 | | 95 | 86 | | | | | | |
| 2000 | 3 | 2 | 86 | 108 | 72 | | | | | |
| **1999** | 4 | 1 | 85 | 96 | 122 | 16 | | | | |
| **1997** | 6 | 1 | 145 | 126 | 43 | 33 | 27 | 15 | | |
| **1995** | 8 | 1 | 91 | 111 | 98 | 62 | 52 | 27 | 11 | 8 |
| Population mean | | | 100 | 105 | 84 | 37 | 40 | 8 | 1 1 | 8 |
| Sample size | | 33 | 33 | 11 | 5 | 3 | 2 | 2 | 1 | 1 |

Table 35. Mean back-calculated total lengths (mm) at annulus for each year-class of smallmouth bass collected by electrofishing-, the Missouri River below Ft Randall Dam during October 2003.

| Year class | Age | N | Back-calculation age | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 2002 | 1 | 22 | 97 | | | | | | | |
| 2001 | 2 | 6 | 95 | 181 | | | | | | |
| 2000 | 3 | 2 | 86 | 194 | 266 | | | | | |
| 1999 | 4 | 1 | 85 | 181 | 303 | 319 | | | | |
| 1997 | 6 | 1 | 145 | 271 | 314 | 347 | 374 | 389 | | |
| 1995 | 8 | 1 | 91 | 202 | 332 | 394 | 446 | 473 | 484 | 492 |
| Population mean | | | 100 | 206 | 304 | 354 | 410 | 431 | 484 | 492 |
| Sample size | | 33 | 33 | 11 | 5 | 3 | 2 | 2 | 1 | 1 |

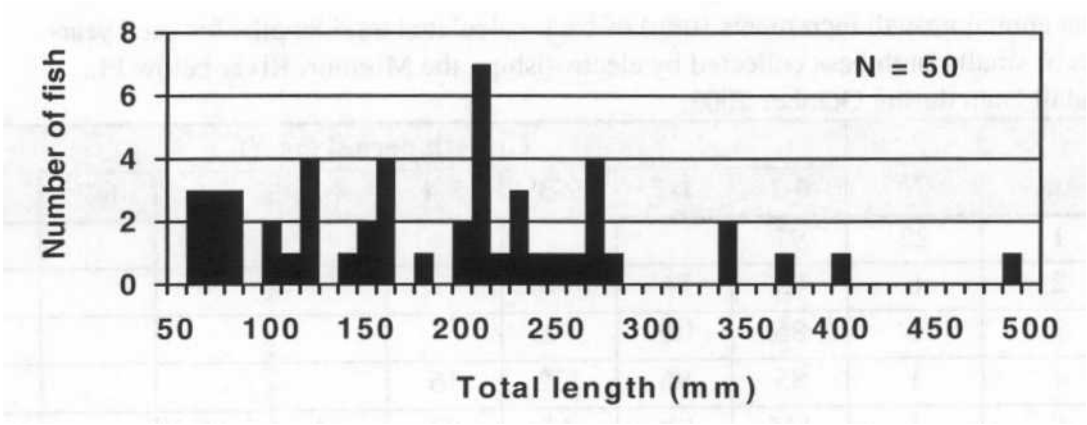


Figure 10. Length frequency of smallmouth bass sampled by electrofishing the Missouri River below Ft. Randall Dam, October 2003. N is the sample size.

Table 36. Age distribution of smallmouth bass collected by electrofishing the Missouri River below Ft. Randall Dam, 1999-2003. Mean age excludes age-0 fish.

| Year class | Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | Mean |
| 1999 | 44 | 20 | 10 | 5 | 3 | 1 | () | 1.8 |
| 2000 | 34 | 17 | 9 | 0 | 0 | 0 | 0 | 1.3 |
| 2001 | 4 | 8 | 10 | 2 | 6 | 0 | 0 | 2.2 |
| 2002 | 65 | 12 | 5 | 2 | 5 | 0 | 2 | 2.3 |
| 2003 | 16 | 23 | 6 | 2 | 1 | 1 | 1 | 1.6 |

Gavins Point Tailwater Smallmouth Bass

Spring electrofishing in the Missouri River below Gavins Point Dam during 2003 produced a sample of 34 smallmouth bass for a catch rate of 34.0 fish/h (Table 37). The PSD was four and RSD-P was also four because only one fish longer than 350 mm was sampled. The PSD continues to be extremely low for a fish population (Anderson and Weithman 1978). Mean *Wr* declined from 96 in 2002 to 88 in 2003 for stock-quality length fish.

Smallmouth bass growth increments in Gavins Point tailwater during 2002 were mostly greater than previous years (Table 38). Total lengths attained during 2002, as determined by back-calculation, are presented in Table 39. Population mean total lengths for all ages, except age 3, were greater than means for South Dakota statewide waters (Willis et al. 2001). Mean age increased to 2.2 years in 2003 (Table 40). Smallmouth bass sampled in 2002 ranged in length from 113 mm to 382 mm (Figure 11). Total length-weight regression equation for smallmouth bass in Gavins Point tailwater is provided in Appendix 3.

Annual survival estimated by catch curve analysis (Ricker 1975), for 2002-2003 pooled data using age-2 and older fish numbers, was 29% with an associated $r^2$ value of 0.99. Annual survival for 2000-2001 pooled data was 26% and for 2001-2002 pooled data was 29%. (Wickstrom 2003). Annual survival has consistently been low over the past few years in the Missouri River below Gavins Point Dam.

Table 37. Catch per unit effort (CPUE, standard error), proportional stock density (PSD), relative stock density for preferred and memorable-length fish (RSD-P and RSD-M respectively), and relative weight (standard error) of stock-quality (S-Q), quality-preferred (Q-P), and preferred-length (P) smallmouth bass collected by spring electrofishing the Missouri River below Gavins Point Dam. N equals the number of stock-length fish sampled.

| Year | CPUE (fish/h) | PSD | RSD-P | RSD-M | Relative weight | | | N |
|---|---|---|---|---|---|---|---|---|
| | | | | | S-Q | Q-P | P | |
| 1997 | 78.5(23.0) | 3 | 0 | 0 | | | | 37 |
| 2000 | 22.0(2.0) | 6 | 0 | 0 | 91(1.0) | 94(0.0) | | 18 |
| 2001 | 44.0(13.2) | 4 | 4 | 0 | 105(1.0) | | 102(0.0) | 28 |
| 2002 | 51.0(31.5) | 0 | 0 | 0 | 96(1.1) | | - | 16 |
| 2003 | 34.0(8.2) | 4 | 4 | 0 | 88(0.8) | | 90(0.0) | 27 |

' not available

Table 38. Mean annual growth increments (mm) of back-calculated total lengths for each year-class of smallmouth bass collected by electrofishing the Missouri River below Gavins Point Dam during May 2003.

| Year class | Age | N | Growth period (ages) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 |
| 2002 | 1 | 2 | 132 | | | | |
| 2001 | 2 | 24 | 102 | 94 | | | |
| 2000 | 3 | 5 | 115 | 56 | 49 | | |
| 1998 | 5 | 1 | 93 | 116 | 42 | 85 | 44 |
| Population mean | | | 1 1 1 | 88 | 46 | 85 | 44 |
| Sample size | | 32 | 32 | 30 | 6 | 1 | 1 |

Table 39. Mean back-calculated total lengths (mm) at annulus for each year-class of smallmouth bass collected by electrofishing the Missouri River below Gavins Point Dam during May 2003

| Year class | Age | N | Back-calculation age | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 |
| 2002 | I | | 132 | | | | |
| 2001 | 2 | 24 | 102 | 196 | | | |
| 2000 | 3 | 5 | 115 | 171 | 220 | | |
| 1998 | 5 | 1 | 93 | 209 | 251 | 336 | 380 |
| Population mean | | | 1 1 1 | 192 | 235 | 336 | 380 |
| Sample size | | 32 | 32 | 30 | 6 | 1 | 1 |

Table 40. Age distribution of smallmouth bass collected by electrofishing the Missouri River below Gavins Point Dam, 2000-2003.

| Year class | Age | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Mean |
| 2000 | 4 | 8 | 9 | 1 | 0 | 2.3 |
| 2001 | 11 | 31 | 1 | 0 | 1 | 1.8 |
| 2002 | 13 | 18 | 4 | 0 | 0 | 1.7 |
| 2003 | 3 | 24 | 5 | 0 | 1 | 2.2 |

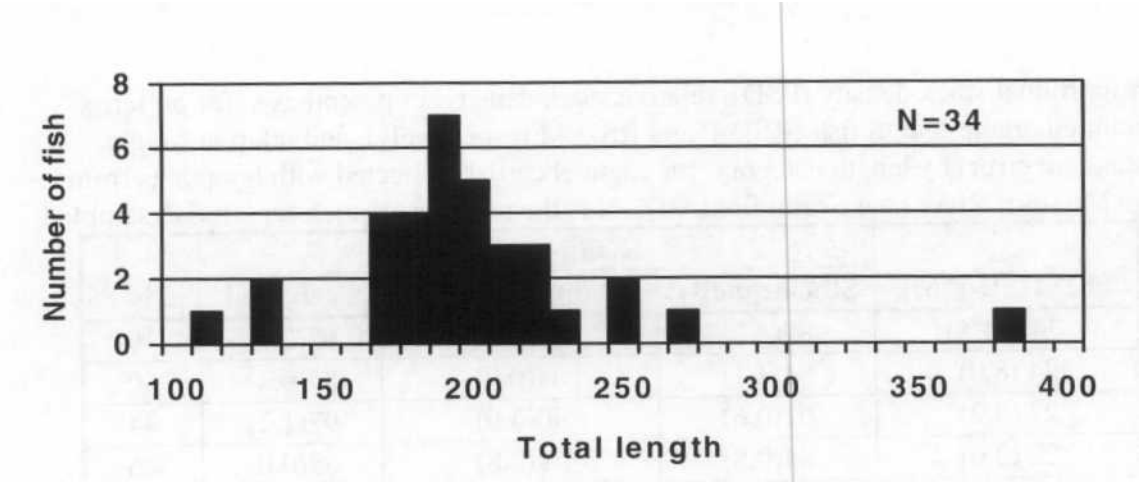


Figure 11. Length frequency of smallmouth bass sampled by electrofishing the Missouri River below Gavins Point Dam, May 2003. N is the sample size.

MISSOURI RIVER-HOOP NETS

Channel Catfish Population Parameters

Cheese-baited hoop nets collected 206 channel catfish in the Missouri River near Springfield, SD during 2003 (Table 41). No repeat capture of a previously marked fish occurred. Mean catch rate of 2.5 fish/net-night was the highest since the survey was initiated in 1995 (Wickstrom 1998). Mean total length of channel catfish captured in 2003 was lower than any previous year except 2002. Channel catfish PSD, at 21 in 2003, was also lower than any previous year (Table 42, Wickstrom 1998). Relative weights for 2003 were among the lowest recorded, especially for preferred-length fish. Lengths of channel catfish sampled in 2003 ranged from 199 mm to 722 mm ( Figure 12).

Table 41. Annual mean hoop net catches (CPUE) of channel catfish from the Missouri River near Springfield, SD (standard error).

| Year | Number of fish | Net-nights | CPUE | Mean length (mm) |
|---|---|---|---|---|
| 1999 | 24 | 80 | 03(0.2) | 435(19.5) |
| **2000** | **99** | 88 | 1.1(1.2) | 304(10.7) |
| **2001** | 76 | 88 | 0.9(0.9) | 326(12.2) |
| **2002** | **140** | 86 | 1.6(1.4) | 277(6.4) |
| **2003** | 206 | 82 | 2.5(1.8) | 296(6.5) |

Table 42. Proportional stock density (PSD), relative stock density, in parenthesis, for preferred and memorable-length fish (RSD-P and RSD-M respectively), and relative weight (standard error) by length category, for channel catfish collected with hoop nets from the Missouri River near Springfield, SD. N is the number of stock-length fish sampled.

| Year | PSD(RSD-P,M) | Relative weight | | | N |
|---|---|---|---|---|---|
| | | Stock-quality | Quality-preferred | Preferred | |
| 1999 | 74 (21,5) | 89(4.7) | 84(2.8) | 92(2.6) | 19 |
| 2000 | 24(8,0) | 84(1.1) | 84(0.9) | 85(6.4) | 40 |
| 2001 | 27(7,2) | 91(0.6) | 90(4.9) | 97(1.2) | 44 |
| 2002 | 22(2,0) | 84(0.8) | 79(2.8) | 68(0.0) | 46 |
| 2003 | 21 (4,4) | 84(0.5) | 80(1.6) | 74(9.4) | 84 |

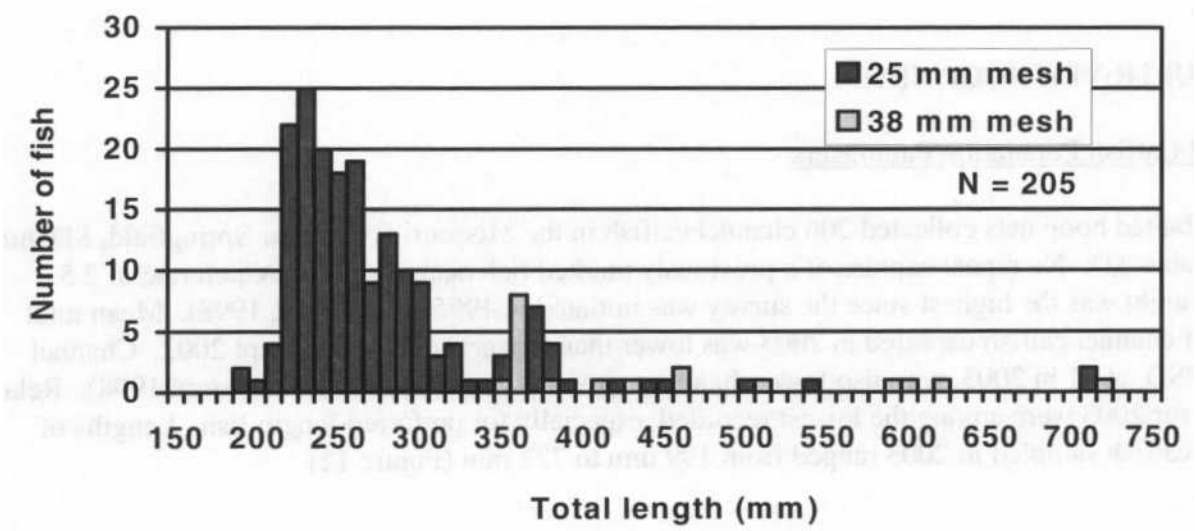


Figure 12. Length frequency of channel catfish, collected with baited hoop nets, from the Missouri River near Springfield, SD during August 2003. N is the sample size.

MSSOURI RIVER-SEINES

Eight species of age-0 fishes and small littoral species were collected with seines near Springfield, SD during July 2003 (Table 43). All species sampled have been previously reported from Lewis and Clark Lake (Wickstrom 2002). Emerald shiner was the most abundant fish species sampled with seines in 2003, followed by age-0 largemouth bass, spotfin shiner, and age-0 smallmouth bass. Emerald shiner, spotfin shiner, and largemouth bass have been sampled during all years the survey has been conducted ( Wickstrom 1999). All species sampled in 2003 were sampled in 2002.

Table 43. Mean catch per seine haul, sampling stations combined, of age-0 fishes and small littoral species from the Missouri River near Springfield, SD, 1999-2003. Standard error is in parenthesis.

| Species | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Bigmouth buffalo | 0.0 | 0.0 | 0.3(0.5) | 0.0 | 0.0 |
| Black crappie | 0.2(0.1) | 0.0(0.0) | 0.0 | 0.2(0.2) | 0.0 |
| Bluegill | 0.1(0.1) | 0.0(0.0) | 0.0 | T | 0.0 |
| Bluntnose minnow* | 0.1(0.1) | 0.0(0.0) | t | 0.0 | 0.0 |
| Emerald shiner* | 2.2(1.0) | 0.4(0.2) | 2.2(0.8) | 0.6(0.6) | 1.3(0.4) |
| Common carp | 0.0 | 0.0 | 0.2(0.1) | 0.1(0.1) | 0.0 |
| Hybognathus sp. | 0.0 | 0.0 | 0.0 | T | 0.0 |
| Johnny darter* | 0.1(0.1) | 0.3(0.2) | 0.3(0.2) | 0.6(0.4) | 0.1(0.1) |
| Largemouth bass | 0.8(0.3) | 1.7(0.8) | 2.0(0.8) | 1.6(0.6) | 0.8(0.4) |
| Northern pike | 0.0 | 0.1(0.3) | 0.0 | 0.0 | 0.0 |
| Red shiner" | t* | 0.0 | T | 0.0 | 0.0 |
| River carpsucker | 0.1(0.1) | 17.4(13.5) | 0.1(0.1) | 0.4(0.2) | 0.1(0.1) |
| Sauger | 0.0 | 0.0 | 0.1(0.1) | 0.2(0.2) | 0.0 |
| Shorthead redhorse | 0.0 | 0.0 | 0.2(0.1) | 0.0 | 0.0 |
| Smallmouth bass | t* | 0.9(0.4) | 0.2(0.1) | 0.6(0.2) | 0.4(0.2) |
| Smallmouth buffalo | 0.2(0.2) | 0.0 | 1.1(0.8) | 0.0 | 0.0 |
| Spotfin shiner | 0.9(0.6) | 1.4(1.3) | 1.0(0.9) | 0.2(0.2) | 0.7(0.3) |
| Spottail shiner* | 0.0 | 0.0 | 0.5(0.2) | 0.0 | 0.0 |
| Walleye | 0.5(0.2) | 0.2(0.1) | T | 0.1(0.1) | 0.2(0.1) |
| White bass | 0.0 | 0.0 | 0.0 | T | 0.0 |
| White crappie | 0.0 | 0.7(0.4) | 0.1(0.1) | 0.2(0.1) | 0.1(0.1) |
| Yellow perch | 0.1(0.1) | 0.7(1.9) | 2.9(1.4) | 0.0 | 0.0 |

t=trace (<0.1)

- includes both adults and age-0 fish

## RARE FISH OBSERVATIONS

One pallid sturgeon was sampled in Lewis and Clark Lake during field activities in 2003. Specifics are provided in this report in the "Lewis and Clark Lake-Gill Nets" section. Pallid sturgeon catch data was reported to Wayne Stancill, United States Fish and Wildlife Service, Ecological Services Field Office, Pierre, SD. Pallid sturgeon is an endangered native species whose survival is jeopardized because their numbers are declining from human activities and they are dependent on unique and limited habitat that has declined (Dakota Chapter of the American Fisheries Society 1994).

## CONCLUSIONS

The walleye/sauger fishery in Lewis and Clark Lake is in the best shape it has been in years. High quality populations are indicated by walleye and sauger CLUE at 10.7 and 8.1, respectively; LSD's of 61 and 93, respectively; and RSD-L's of 1 1 and 62, respectively. Recent growth for both species was greater than the population means for ages 1-5 and Wr's for most length groups increased from 2002 to 2003. Large year-classes produced in 2001 are poised to enter the fishery in a year or two and sustain the fishery at the current high level.

Restrictive modifications made to harvest regulations in 2000 appear to be having a positive effect. Abundance of walleyes longer than 380 mm has increased since 2000 and abundance of sauger longer than 380 mm has remained stable since 2001. Recent large walleye and sauger year-classes, which are not yet legal to harvest, have remained strong and should contribute to the harvest in future years. Walleye and sauger condition have remained unchanged since the 381 mm minimum length harvest regulation took effect in 2000.

Total annual mortality was nearly the same for walleyes and saugers in Lewis and Clark Lake in 2003, 35% for sauger and 34% for walleye. Annual angling mortality was approximately 7% for saugers, in a 2002 tagging study (unpublished data), which leaves annual natural mortality at 28%. Annual angling mortality for walleyes was approximately 18% in the 2002 tagging study, which puts annual natural mortality was 16%. If angling mortality and natural mortality are compensatory, then natural mortality is higher for saugers than walleyes, and saugers may be able to withstand higher harvest. But because the tag non-reporting rate was not determined during the study, it was not included in estimates of exploitation and total mortality. Therefore, the actual exploitation rate may be higher than that reported.

Overall abundance of prey species in Lewis and Clark Lake in 2003 increased from 2002 levels. Common shiner, emerald shiner, spotfin shiner, spottail shiner, gizzard shad, and age-0 white bass experienced increased abundance in 2003. Correspondingly, condition of nearly all predators in Lewis and Clark Lake increased from 2002 to 2003. Walleye, sauger, channel catfish, and smallmouth bass had higher Wr's in 2003 than in 2002.

Largemouth and smallmouth bass are at their lowest levels in a number of years. Abundance of smallmouth bass in the Missouri River consistently declined in 2003 from 2002 at sampling stations from Ft. Randall Dam to Gavins Point Tailwater. Mean CPUE for smallmouth bass near Springfield increased, but age-1 fish heavily influenced the catch. Similarly, CLUE of largemouth bass in the Missouri River near Springfield increased, but again age-1 fish dominated the catch. Conversely, population size structure of largemouth and smallmouth bass generally increased over past years because as abundance declines, the remaining individuals get older and larger.

Although channel catfish in Lewis and Clark Lake and the Missouri River near Springfield were collected with different sampling gear, some general comparisons between the populations in different habitat types can be made. Abundance of channel catfish in Lewis and Clark Lake continued to decline in 2003, while abundance of channel catfish in the Missouri River near Springfield increased. Population size structure of channel catfish in Lewis and Clark Lake and the Missouri River near Springfield both declined in 2003. However, *Wr's* for channel catfish in Lewis and Clark Lake were

higher than channel catfish in the more revering habitat of the Missouri River near Springfield. It most certainly takes more energy for o fish to live in o revering environment than o reservoir. Relative weights for channel catfish in Lewis and Clark Lake, in 2003, for the various length categories, were similar, while relative weights for channel catfish in the Missouri River near Springfield decreased as fish length increased. There is most likely a shortage of preferred size prey for larger channel catfish in the revering habitat.

Flathead catfish in Lewis and Clark Lake apparently hove adequate reproduction and recruitment to sustain the population. Small fish were evidently difficult to sample in Lewis and Clark Lake because few age I and 2 fish ore represented in the sample, while fish of the same year-class in successive years ore well represented. Stouffer and Keened (1999) found that flathead catfish >600 mm were difficult to capture by electrofishing because they were able to resist the effects of on electrical field.

Overall, the outlook for fishing opportunity and success at Lewis and Clark Lake is excellent. Walleye and sauger abundance and population structure hove remained high. Although the abundance of channel catfish decreased in the reservoir in 2003, the proportion of larger fish in the population increased, which should be favorable for anglers. Abundance of channel catfish in the delta near Springfield, SD hos increased the lost couple of years, but small fish currently dominate the population. There is on adequate number of larger channel catfish in the delta to interest anglers and the small fish will contribute to the fishery in the near future. Flathead catfish in Lewis and Clark Lake offer on alternative to those who appreciate them. Abundance of adult largemouth and smallmouth boss, in both the reservoir and river upstream of the reservoir, hove declined the post few years, but o supply of favorable size fish is present for anglers pursuing them. Unfortunately, the smallmouth boss population in Gavins Point Dam tailwater continues to be dominated by small fish whose condition hos decreased from 2001.

## RECOMMENDATIONS

1. Continue annual fish population surveys on Lewis and Clark Lake. These surveys provide information on abundance, reproduction, recruitment, growth, condition, survival, mortality, and allow evaluation of management objectives listed in the Missouri River Fisheries Strategic Plan.

2. Annually evaluate current walleye, sauger, largemouth boss, and smallmouth boss regulations to determine effectiveness at maintaining the quality of the Lewis and Clark Lake fishery.

3. Document population dynamics and age and growth of flathead catfish in order to evaluate management efforts of this species in Lewis and Clark Lake.

4. Assess smallmouth boss populations in Lewis and Clark Lake, in the Missouri River below Gavins Point Dam, below Ft. Randall Dam, and in the transition zone so that management efforts con be evaluated.

5. Assess the largemouth boss population in the transition zone and evaluate management efforts.

6. Periodically conduct creel surveys to assess angler resource ure and fish harvest.

7. Continue to document rare fish species observations and locations. 8. Document

occurrence and location of aquatic nuisance species.

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Appendix 1. Common and scientific names of fishes mentioned in this report.

| Common Name | Scientific Name |
|---|---|
| Bigmouth buffalo | Ictiobus *cyprinellus* |
| Black crappie | *Pomoxis nigromaculatus* |
| Bluegill | *Lepomis macrochirus* |
| Bluntnose minnow | *Pimephales notatus* |
| Brassy minnow | *Hyhognathus hankinsoni* |
| Channel catfish | *Ictalurus punctatus* |
| Common carp | *Cyprinus carpio* |
| Common shiner | *Notropis coronets* |
| Creek chub | *Semitones atromaculatus* |
| Emerald shiner | *Notropis atherinoides* |
| Fathead minnow | *Pimephales promelas* |
| Flathead catfish | *Pylodictus olivaris* |
| Freshwater drum | *Aplodinotus grunniens* |
| Gizzard shad | *Dorosoma cepedianum* |
| Goldeye | *Hiodon alosoides* |
| Golden shiner | *Notemigonus crysoleucas* |
| Grass pickerel | *Esox American's vermiculatus* |
| Johnny darter | *Etheostoma nigrum* |
| Largemouth bass | *Micropterus salmoides* |
| Northern pike | *Esox lucius* |
| Rainbow smelt | *Osmerus mordax* |
| Red shiner | *Notropis lucreIsis* |
| River carpsucker | *Carbides carpio* |
| Rock bass | *Ambloplites ruprestris* |
| Paddlefish | *PolyodoI spatula* |
| Pallid sturgeon | *ScaphirhyIchus album* |
| Sauger | *Stizostedion canadense* |
| Shorthead redhorse | *Moxostoma macrolepidotum* |
| Shortnose gar | *Lepisosteus platostomus* |
| Silver chub | *Hybopmim storeriana* |
| Shortnose gar | *Lepisosteus platostomus* |
| Smallmouth bass | *Micropterus dolomieu* |
| Smallmouth buffalo | *Ictiobus bubalus* |
| Spotfin shiner | *Notropis spilopterus* |
| Spottail shiner | *Notropis hudsonius* |
| Walleye | *Stizostedion vitreum* |
| White bass | *Morone chrysops* |
| White crappie | *Pomoxis annularius* |
| Yellow perch | *Perca, flavescens* |

Appendix 2. Standard weight equations used for relative weight calculations. Length is in millimeters. weight is in grams, and logarithms are to base,().

| Species | Equation |
|---|---|
| Channel catfish | LogWs=3.2494Lo-TL-5.800 |
| Flathead catfish | LogWs=3.082LogTL-5.156 |
| Freshwater drum | LogWs=3.204LogTL-5.419 |
| Gizzard shad | LogWs=3.170LogTL-5.376 |
| Largemouth bass | LogWs=3.19LogTL-5.316 |
| River carpsucker | LogWs=2.992LogTL-4.839 |
| Sauger | LogWs=3.187LogTL-5.492 |
| Smallmouth bass | LogWs=3.200LogTL-5.329 |
| | LogWs=3.I80LogTL-5.453 |

Walleye

Appendix 3. Total length (TL; mm) - weight (WT; g) regression equations, mean lengths, and mean weights of fishes sampled in this survey. Logarithms are to base 10. N is the sample size excluding age-0 fish. Mean (X) lengths (mm) and weights (g) do not include age-0 fish. Standard errors are in parenthesis. GP is Gavins Point, TW is tail water, and FR is Pt Randall

| Species | Year | N | Equation | R' | X TL | X WT |
|---|---|---|---|---|---|---|
| Walleye | 1999 | 40 | LogWT=3.116LooTl-5.388 | 0.99 | 360(13.5) | 479(60.9) |
| | 2000 | 46 | LogWT=3.I39LogTL-5.446 | 0.99 | 367(1 1.2) | 467(55.6) |
| | 2001 | 63 | LogWT=3.200LogTL-5.572 | 0.99 | 415(9.1) | 710(46.0) |
| | 2002 | 76 | LogWT=3.267LogTL-5.770 | 0.99 | 367(14.2) | 465(36.1) |
| | 2003 | 112 | LogWT=3.080LogTL-5.274 | 0.99 | 359(9.8) | 507(34.0) |
| Sauger | 1999 | 70 | LogWT=3.134LogTL-5.467 | 0.99 | 391(7.2) | 491(26.7) |
| | 2000 | 57 | LogWT=3.078LogTL-5.329 | 0.99 | 372(9.4) | 428(32.9) |
| | 2001 | 85 | LogWT=3.053LogTL-5.231 | 0.99 | 401(7.0) | 562(29.1) |
| | 2002 | 102 | LogWT=3.225LogTL-5.698 | 0.99 | 376(7.2) | 461(27.3) |
| | 2003 | 81 | Lo(·WT=3.027LogTL-5.179 | 0.98 | 363(11.1) | 466(27.9) |
| Channel catfish Gill nets | 1999 | 49 | Log Wt=3.3 l 7LogTL-5.926 | 0.99 | 391(17.1) | 671(111.9) |
| | 2000 | 47 | LogWT=3.211LogTL-5.643 | 0.99 | 430(16.6) | 819(103.1) |
| | 2001 | 55 | LogWT=3.226LogTL-5.682 | 0.99 | 418(14.1) | 746(92.5) |
| | 2002 | 38 | LogWT=3.310LogTL-5.912 | 0.99 | 423(18.4) | 778(107.0) |
| | 2003 | 29 | LogWT=3.33lLogTL-5.957 | 0.99 | 484(26.8) | 1297(204.0) |

Appendix 3 continued..

| | | | | | | |
|---|---|---|---|---|---|---|
| Large-mouth bass | 1999 | 21 | LogWT=3.149LogTL-5.178 | 0.98 | 341(18.1) | 744(97.1) |
| | 2000 | 45 | LogWT=3.426LogTL-5.863 | 0.99 | 184(15.3) | 204(53.4) |
| | 2001 | 6 | LogWT=3.459LogTL-5.998 | 0.99 | 344(40.9) | 752(298.0) |
| | 2003 | 36 | LogWT=3.264LogTL-5.489 | 0.99 | 266(17.6) | 423(73.3) |
| Channel catfish Hoop nets | 1999 | 24 | LogWT=3.237LogTL-5.705 | 0.99 | 435(31.0) | 1012(216.0) |
| | 2000 | 99 | LogWT=3.077LogTL-5.306 | 0.99 | 304(10.1) | 324(52.1) |
| | 2001 | 75 | LogWT=3.194LogTL-5.581 | 0.99 | 326(12.2) | 416(74.3) |
| | 2002 | 140 | LogWT=2.913LogTL-4.907 | 0.98 | 277(6.4) | 200(18.1) |
| | 2003 | 174 | LogWT=2.991LogTL-5.106 | 0.99 | 305(7.2) | 294(35.1) |
| Flathead catfish | 1999 | 43 | LogWT=3.177LogTL-5.434 | 0.98 | 248(13.5) | 283(45.2) |
| | 2000 | 41 | LogWT=3.139LogTL-5.324 | 0.99 | 290(18.3) | 392(61.9) |
| | 2001 | 68 | LogWT=3.047LogTL-5.131 | 0.99 | 308(13.6) | 409(49.5) |
| | 2002 | 81 | LogWT=2.90ILogTL-4.751 | 0.96 | 295(11.7) | 351(36.9) |
| | 2003 | 45 | LogWt=2.980LogTL-4.960 | 0.98 | 289(17.3) | 396(65.2) |
| Small-mouth bass GP Dam | 1999 | 67 | LogWT=2.937LogTL-4.748 | 0.97 | 233(5.7) | 181(13.9) |
| | 2000 | 21 | LogWT=3.188LogTL-5.327 | 0.99 | 249(18.3) | 285(65.3) |
| | 2001 | 59 | LogWT=2.930LogTL-4.728 | 0.99 | 225(6.5) | 168(15.5) |
| | 2002 | 75 | LogWT=3.137LogTL-5.223 | 0.98 | 276(7.9) | 337(35.5) |
| | 2003 | 25 | LogWT=3.461LogTL-6.007 | 0.99 | 275(18.3) | 406(92.4) |
| Small-Mouth Bass GPTW | 2000 | "2 | LogWT=3.196LogTL-5.360 | 0.99 | 221(12.5) | 167(26.4) |
| | 2001 | 42 | LogWT=2.975LogTL-4.782 | 0.98 | 192(7.5) | 124(17.1) |
| | 2002 | 35 | LogWT=3.035LogTL-4.958 | 0.99 | 174(9.4) | 92(13.3) |
| | 2003 | 34 | LogWT=3.132LogTL-5.220 | 0.99 | 202(7.6) | 121(21.3) |
| Small-mouth bass FRTW | 1999 | 35 | LogWT=3.083LogTL-5.038 | 0.99 | 249(9.9) | 271(34.7) |
| | 2000 | 26 | LogWT=3.091LogTL-5.044 | 0.96 | 248(7.4) | 245(22.9) |
| | 2001 | 30 | LogWT=3.065LogTL-4.969 | 0.99 | 253(14.7) | 322(45.2) |
| | 2002 | 26 | LogWT=3.005LogTL-4.851 | 0.99 | 262(17.9) | 355(64.3) |
| | 2003 | 34 | LogWT=3.072LogTL-5.019 | .099 | 241(46.8) | 244(48.0) |
| Small-mouth bass Springfield | 1999 | 29 | LogWT=3.116LogTL-5.134 | 0.98 | 344(11.3) | 727(69.5) |
| | 2000 | 15 | LogWT=3.247LogTL-5.46l | 0.99 | 302(31.9) | 593(138.3) |
| | 2001 | 9 | LogWT=3.l l 7LogTL-5.150 | 0.99 | 345(16.8) | 611(93.0) |
| | 2003 | 21 | LogWT=3.228LogTL-5.429 | 0.99 | 280(27.7) | 492(104.6) |

Appendix 4. Proportional stock density (PSD), relative stock density of preferred and memorable-length fish (RSD-P and RSD-M), and mean relative weight (Wr) for freshwater drum, river carpsucker, and gizzard shad collected from Lewis and Clark Lake with gill nets during late summer. N is the number of stock length-fish sampled. Standard errors are in parenthesis.

| Year | PSI) | RSD-P | RSD-M | Wr | N |
|---|---|---|---|---|---|
| **Freshwater drum** | | | | | |
| 2000 | 80 | 69 | 0 | 91(0.9) | 49 |
| 2001 | 95 | 95 | 0 | 95(0.8) | 21 |
| 2002 | 88 | 88 | 0 | 89(1.2) | 16 |
| 2003 | 84 | 82 | 0 | 91(0.7) | 45 |
| **River carpsucker** | | | | | |
| 2000 | 100 | 80 | 10 | 880.0) | 20 |
| 2001 | 98 | 87 | 0 | 95(0.7) | 85 |
| 2002 | 95 | 95 | 5 | 88(1.2) | 19 |
| 2003 | 75 | 0 | 0 | 8702) | 4 |
| **Gizzard shad** | | | | | |
| 2000 | 100 | | | 105(0.2) | 68 |
| 2001 | 100 | * | * | 113(0.2) | 64 |
| 2002 | 31 | * | * | 99(2.7) | 13 |
| 2003 | 100 | * | * | 96(0.0) | 1 |

* not established